ORDER NO. MTNC000855C1
B1

# Service Manual

Color Television

## Main Manual
## (MJ4M)

**Panasonic**

| Models | Chassis |
|---|---|
| **CT-20SX10B** | **AP354** |
| **CT-20SX10CB** | **AP354** |
| **CT-24SX10B** | **AP353** |
| **CT-24SX10CB** | **AP353** |
| **CT-F2110XB** | **XP353** |
| **CT-F2510XB** | **XP353** |

This Service manual is issued as a service guide for the models of the **MJ4M** family listed above. Included in this manual are a set of schematic, block diagrams, functional descriptions, alignment procedures, disassembly procedures, and a complete parts list.

"**WARNING!** This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death."

The service technician is required to read and follow the "**Safety Precautions**" and "**Important Safety Notice**" in this Main Manual.

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# Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol ⚠ and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent X-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

## Safety Precautions

### General Guidelines

An **Isolation Transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the Receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

**Always Replace Protective Devices**, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this Receiver is operating. Operation of the Receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

**Extreme care** should be practiced when **Handling the Picture Tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **Test Picture Tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **50.0kV** without causing X-ray radiation.

**Before returning a serviced receiver to the owner**, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

### Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

### Leakage Current Hot Check (Fig. 1)

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15μF capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 1/2 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.

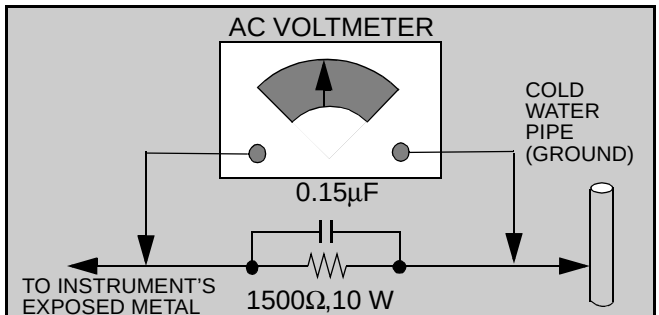


Figure 1. **Hot Check Circuit**

### X-ray Radiation

**WARNING:** The potential source of X-ray radiation in the TV set is in the High Voltage section and the picture tube.

***Note:*** *It is important to use an accurate, calibrated high voltage meter.*

Set the **brightness, picture, sharpness** and **color** controls to Minimum.

Measure the High Voltage. The high voltage should be **30.55kV ± 1.25kV for 25in models and 28.80kV ± 1.25kV for 20in models**. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

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# Service Notes

***Note: These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.***

## Leadless Chip Component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6kΩ resistor, 0 = 0Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

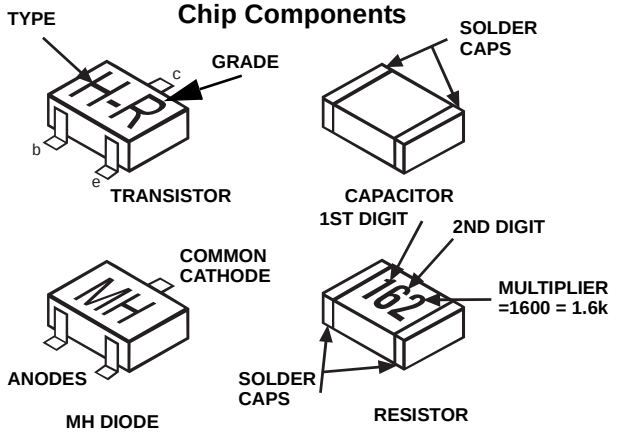
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

## Component Removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

## Chip Component Installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

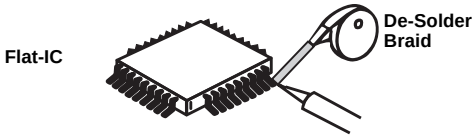



## How to Replace Flat-IC

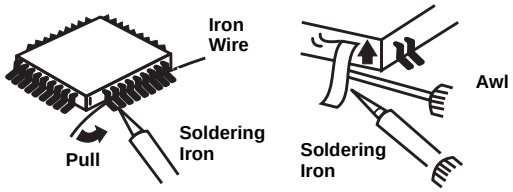
**- Required Tools -**

- Soldering iron
- De-solder braids
- Iron wire or small awl
- Magnifier

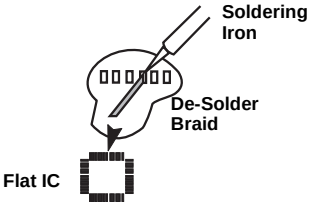
1. Remove the solder from all of the pins of a Flat-IC by using a de-solder braid.



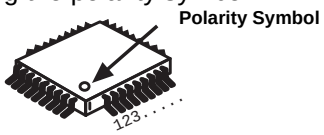

2. Put the iron wire under the pins of the Flat-IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.



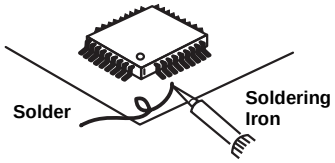

3. Remove the solder from all the pads of the Flat-IC by using a de-solder braid.



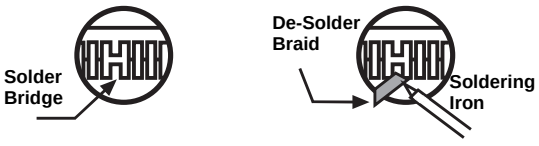

4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol.




5. Solder all pins to the soldering pads using a fine tipped soldering iron.




6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



# Service Notes (Continued)

**IMPORTANT:** To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR DAG wire are securely connected.

## CAUTION:

The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the Receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (Hot ⏚) or (Cold ⏚) when servicing, or incorrect voltages will be measured.

## WARNING:

This Receiver has been designed to meet or exceed applicable safety and X-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol ⚠ on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

## X-RAY PROTECTION CIRCUIT TEST

### Preparation

1. Connect a High voltage meter (Capable of handle 50kV) to the CRT anode
2. Connect a variable resistor (3K) in series with a 100 ohms resistor, across (in parallel) R849.
3. Connect a jumper in R850 position (make a short on R850).

**Procedure:**

1. Plug receiver to120V ac. and turn it on.
2. Apply a monoscope pattern.
3. Set PICTURE and BRIGHTNESS to normal.
4. Set variable resistor to maximum level (3k)
5. Slowly decrease variable resistor value.
6. Adjust beam current between 50μA and 100μA with the SCREEN VR of FBT.
7. Adjusting the Variable REsistor, check if the set starts to loose synchrony
8. Confirm the reading from the **High Voltage** meter is **38KV for 25" models and 34KV for 20" models**.
9. Turn Off the receiver and remove the jumper.

# Receiver Feature Table

| FEATURE\MODEL | CT-24SX10B & CT-24SX10CB | CT-20SX10B & CT-20SX10CB | CT-F2510XB | CT-F2110XB |
|---|---|---|---|---|
| **Chassis** | MJ4M | MJ4M | MJ4M | MJ4M |
| **# of channels** | 181 | 181 | 181 | 181 |
| **Menu language** | ENG/ESP/FR | ENG/ESP/FR | ENG/ESP/FR | ENG/ESP/FR |
| **Closed Caption** | X | X | X | X |
| **V-Chip (USA/CANADA)** | X | X | X | X |
| **75 Ohm Input** | X | X | X | X |
| **Remote Model #** | EUR511502 | EUR511502 | EUR511502 | EUR511502 |
| **Picture tube** | A68LUQ085X | A68LUQ085X | A68LUQ085X | A68LUQ085X |
| **Flat** | (4:3) | (4:3) | (4:3) | (4:3) |
| **Comb Filter** | 3 Dig | 3 Dig | 3 Dig | 3 Dig |
| **VM** | X | X | X | X |
| **Color Temp** | X | X | X | X |
| **V/A norm (X=both)** | X | X | X | X |
| **MTS/SAP/DBX** | X | X | X | X |
| **Built-in audio power** | 7W/CH(10%) | 7W/CH(10%) | 7W/CH(10%) | 7W/CH(10%) |
| **# of speakers** | 2 | 2 | 2 | 2 |
| **Speaker Type** | Open Dome | Open Dome | Open Dome | Open Dome |
| **Bass/Bl/Tre Control** | X | X | X | X |
| **AI Sound** | X | X | X | X |
| **Surround** | X | X | X | X |
| **A/V in (rear/front)** | 3(2/1) | 3(2/1) | 3(2/1) | 3(2/1) |
| **Component Input** | 1 | 1 | 1 | 1 |
| **Audio Out (FAO,VAO)** | F,V | F,V | F,V | F,V |
| **S-VHS Input (rear/front)** | 2(1/1) | 2(1/1) | 2(1/1) | 2(1/1) |
| **EPJ/HPJ/MISC** | HPJ | HPJ | HPJ | HPJ |
| **Dimensions mm (HxWxD) in** | 636x720x573<br>24.46x27.69x22.3 | 570x638x569<br>21.92x24.53x21.88 | 636x720x573<br>24.46x27.69x22.3 | 570x638x569<br>21.92x24.53x21.88 |
| **Weight (kg/lbs)** | 36.09/79.4 | 25/55 | 36.09/79.4 | 25/55 |
| **Power source (V/Hz)** | 120/60 | 120/60 | 120/60 | 120/60 |
| **Anode voltage** | 30.55kV±1.25kV | 28.8kV±1.25kV | 30.55kV±1.25kV | 28.8kV±1.25kV |
| **Video input jack** | 1 $V_{p-p}$ 75Ω phono jack | 1 $V_{p-p}$ 75Ω phono jack | 1 $V_{p-p}$ 75Ω phono jack | 1 $V_{p-p}$ 75Ω phono jack |
| **Audio input jack** | 500mV RMS 47kΩ | 500mV RMS 47kΩ | 500mV RMS 47kΩ | 500mV RMS 47kΩ |

Table 1. **Receiver Features**

Specifications are subject to change without notice or obligation.
Dimensions and weights are approximate.

# Board Designation

| Board | Part No. | CT-24SX10B & CT-24SX10CB | CT-20SX10B & CT-20SX10CB | CT-F2510XB | CT-F2110XB | Description |
|---|---|---|---|---|---|---|
| A-Board | TNP2AH022 | AB | AC | AE | AF | Main Chassis |
| C-Board | TNP2AA068 | AB | AC | AB | AC | CRT Drive |
| G-Board | TNP2AA071 | AB | AC | AB | AC | Audio Circuit |
| H-Board | TNP2AA070 | AA | AA | AA | AA | A/V Input Switch |
| Q-Board | TNP2AA067 | AB | AC | AB | AC | H-Drive |

**IMPORTANT**

When ordering boards, please add an “S” to the part number, for example TNP2AH022AA should be ordered as TNP2AH022AAS.

# Location of Controls (Receiver)

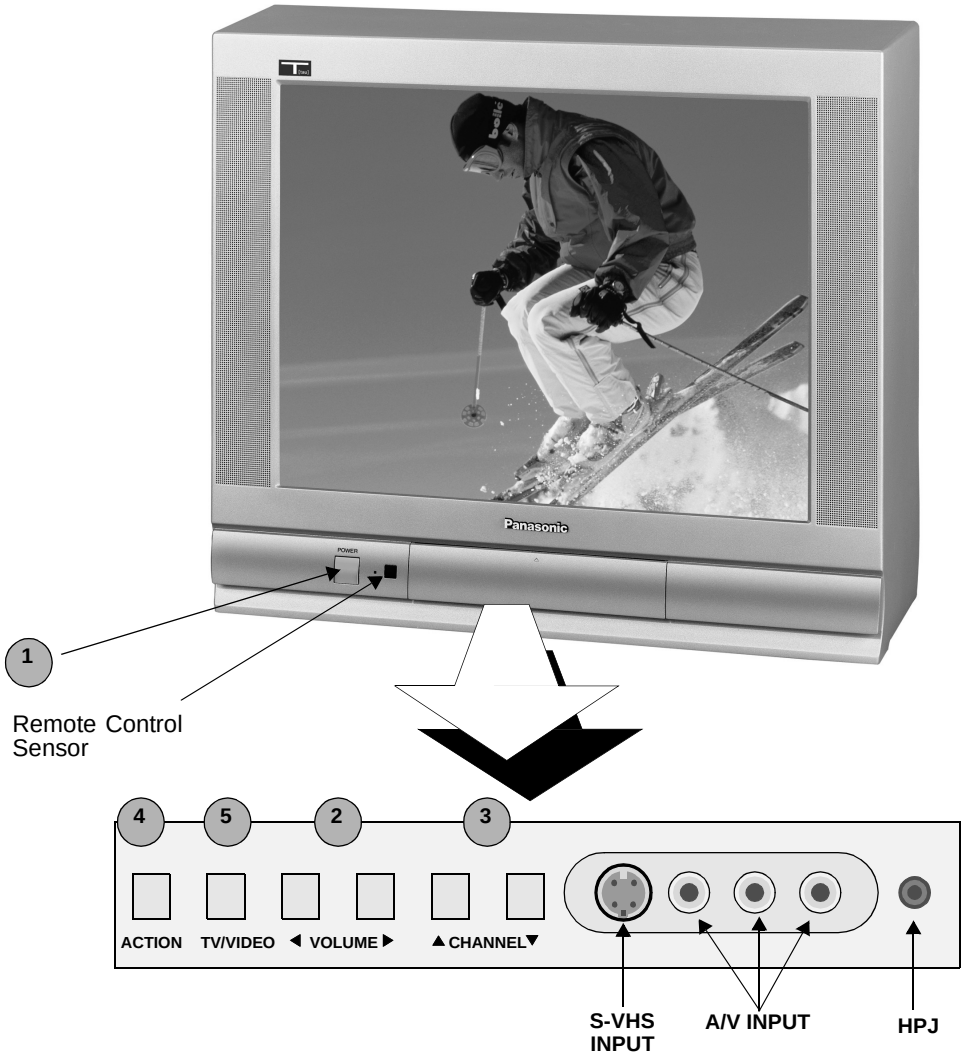



**Figure 2.** Location of Controls Receiver

## Quick Reference Control Operation

| Quick Reference Control Operation | |
|---|---|
| 1 | **Power Button -** Press to turn ON or OFF. |
| 2 | **Volume Buttons -** Press to adjust Sound Level, or to adjust Audio Menus, Video Menus, and select operating features when menus are displayed |
| 3 | **Channel Buttons -** Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select Cable Converter box channels after programming Remote Control Infrared codes (the TV/AUX/CABLE switch must be set in CABLE position). |
| 4 | **Action Button -** Press to display Main Menu and access On Screen feature and Adjustment Menus. |
| 5 | **TV/Video Button -** Press to select TV or any Video Input, for the Main Picture |

# Location of Controls (Remote)

| POWER Button |
| --- |
| Press to turn ON and OFF. |
| **MUTE Button** |
| Press to mute sound.<br>A second press resumes sound.<br>Press also to access and delete Closed Caption display. |
| **VCR, DVD, TV, CBL, DBS** |
| Component function buttons |
| **VOL (volume) Buttons** |
| Press to adjust TV sound level.<br>Use with Channel buttons to navigate in menus. |
| **R-TUNE (Rapid Tune) Button.** |
| Press to switch to the previous channel. |
| **ACTION Button** |
| Press to display Main Menu and access or exit On Screen features and Adjustment Menus. |
| **REW, PLAY, FF, TV/VCR, STOP, PAUSE, REC, VCR CHANNEL** |
| Component function buttons. |

| LIGHT |
| --- |
| Press to light Remote control buttons |
| **TV/VIDEO Button** |
| Press to select TV or any Video input. |
| **CH (channel) Buttons** |
| Press to select channels.<br>Use with volume buttons to navigate in menus. |
| **DBS EXIT, DBS GUIDE** |
| DBS function buttons. |
| **RECALL Button** |
| Press to display Time, status of Sleep Timer, Channel, Video mode and Channel Caption (Station Identifier). |
| **“0” - “9”** |
| Press numeric keypad to select any channel. |

**EUR511502**

**Figure 3.** Location of Controls (Remote)

**For more functions and information about this Remote Control, refer to the Remote Guide listed in Parts List of this manual**

# Disassembly for Service

## Back Cover

Remove all the screws marked with an arrow( ◄ ) from the back of the Receiver.

***Note:*** *Screw configuration, type, and number of screws vary depending on the model of the Receiver serviced and the application; various models are covered in this Manual. Use same hardware when reassembling the receiver.*

- 3 screws at the top edge of the Receiver.
- 1 screw at each lower corner of the Receiver.
- 2 screws by the A/V bracket top edge.
- 1 screw by the A/V bracket bottom edge.

## A-Board - Main Chassis (See Fig. 5)

The Q and H-Board are assembled on the Main chassis (A-Board). When servicing these boards, extension cables may be required. Cables kit can be ordered from Matsushita Services Company, see Parts List for parts number. The A-Board assembly rest on a chassis tray along with the G-Board.

Slide chassis tray out. Gently lift, tray and pull out. Disconnect plug connectors; release wire ties and holders as required for complete chassis removal.

- A-Board is secured to the chassis tray with 8 screws.
- The G-Board is secured to the chassis tray with 5 screws
- The A-Board is mated to the G-Board with to flexible connectors: A22 & A23 (G2 and G3 on the G-Board, respectively). To remove either boards, unplug the connectors on the A-Board.

***Note:*** *Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.*

## C-Board - CRT Output

Plugs into the socket on the CRT neck.

To unplug Screen and Focus cables from CRT socket, lift the tabs on the socket and pull the cables as shown. To plug cables, close the tabs then insert the cable.

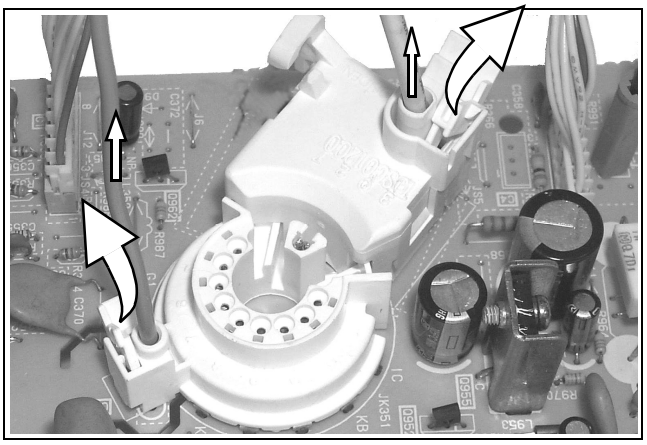


Figure 4. Focus and Screen cables.

## H-Board - A/V Jacks, S-Video Connectors and Video Switch

Plugs onto the A-Board at the A11 (H11) connector

## Q-Board - Horizontal Drive

Plugs onto the A-Board at the A6, A7 and A8 (QC6, QC7 and QC8) connectors. Is secured to Q551 heat sink by two screws.

***Note:*** *Use a small flat head screwdriver to release the connector locking tabs.*

## Speaker Dome

Each speaker is secured to the front cabinet with 2 screws. (See Fig. 6)

# Disassembly for CRT Replacement

1. Discharge the CRT as instructed in the **Safety Precautions** (see page 2) and remove 2nd anode button from the CRT.
2. Remove Speaker Modules (R & L)
3. Disconnect:
   A-Board = Deflection Yoke (DY), Deg. Coil
   G-Board = Speakers (G8),
   C-Board = C2 Conv. Yoke, C1 DAG GND.
4. Remove Convergence and Deflection Yoke from CRT neck.
5. Perform complete removal of the Main Chassis, G-Board and CRT-Board as instructed in **Disassembly for Service.**

## CRT Replacement

1. Perform **Disassembly for CRT Replacement** procedure.
2. Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the **Safety Precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware as they are remove from the CRT mounting brackets at each corner of the CRT.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.
6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.
   **To remove and remount the degaussing coil:** The degaussing coil is held in place by clampers fastened to the CRT corner ears. These clampers must be installed onto the replacement CRT prior to mounting the degaussing coil.
   **To remove and remount the dag ground braid:**
   a. Unhook the coil spring from the bottom corners of the CRT ears.
   b. Release the braid loop from the upper corners of the CRT ears.
7. Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
8. Replace the components on CRT neck and reinstall into cabinet. Verify that all ground wires and circuit board plugs get connected.

# Identification of Main Components

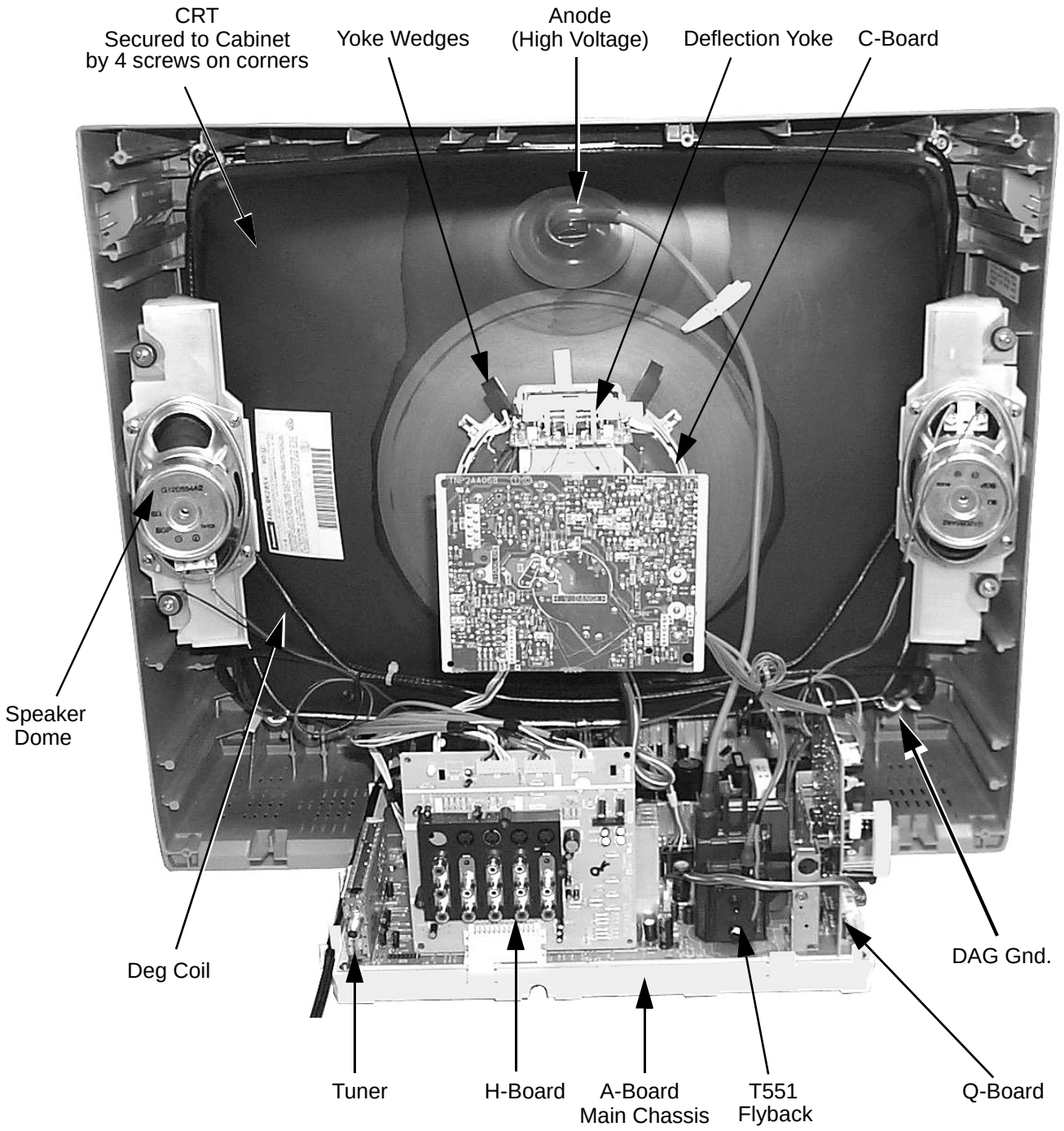



Figure 5. Components Identification

***Note:*** After servicing the receiver, remember to dress the cables, as shown above.

# Identification of Main Components

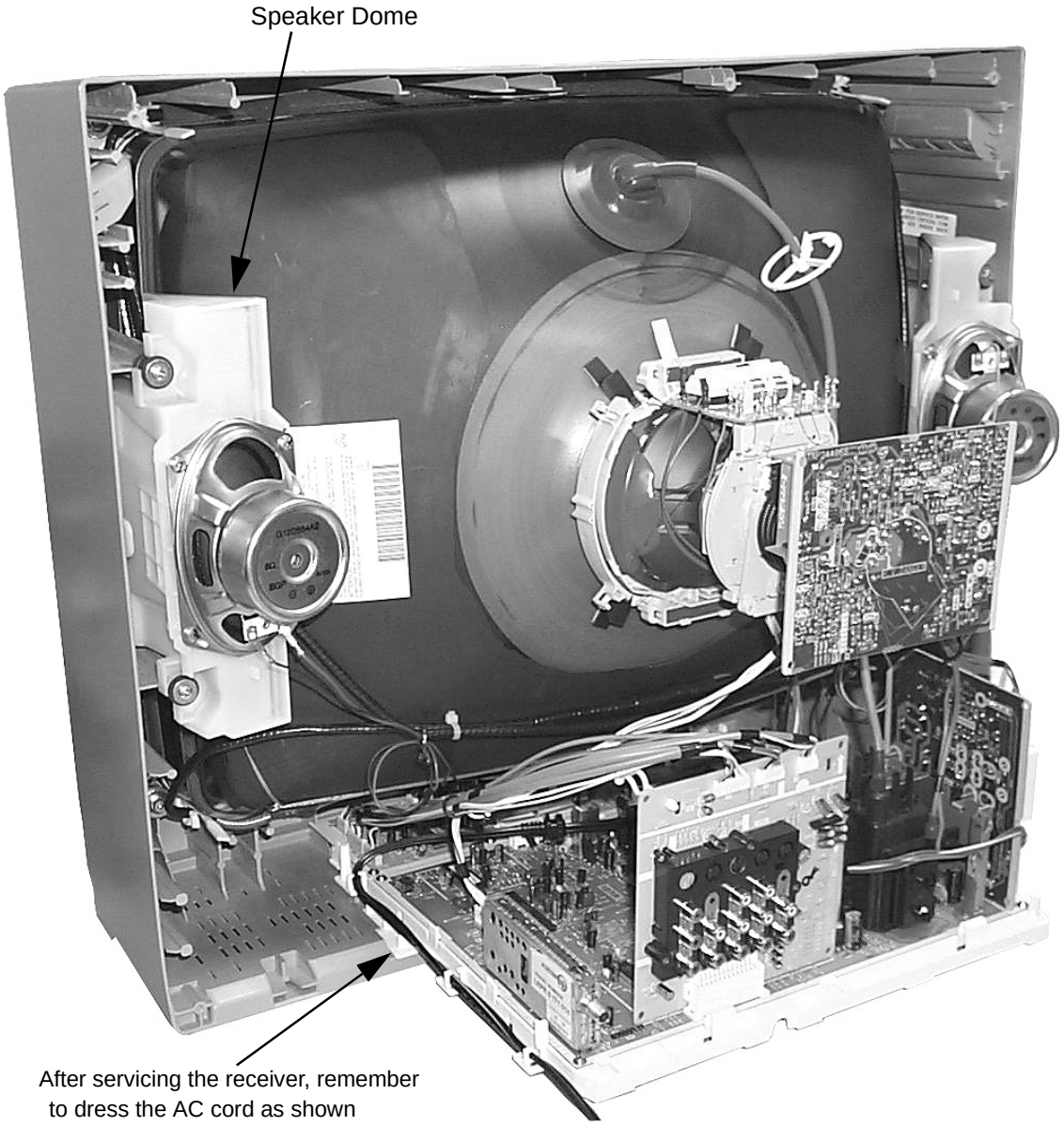



Figure 6. RECEIVER REAR VIEW DETAIL
Figure 7.

***Note:*** After servicing the receiver, remember to dress the cables, as shown above.

# Identification of Main Components

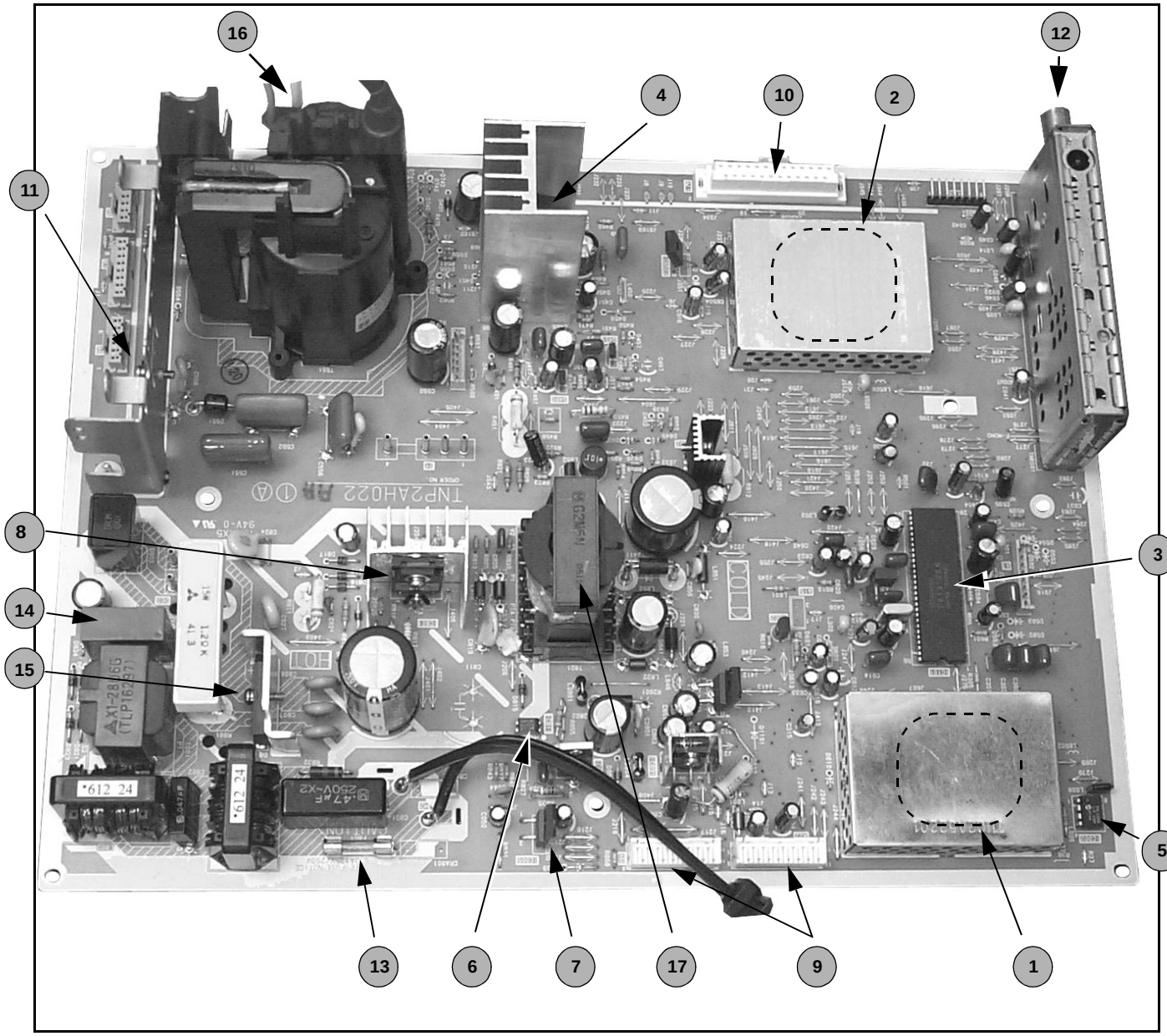



**Figure 8.** View of Main Board Assemblies.

| NO. | LOCATION OF COMPONENTS | | | | |
|---|---|---|---|---|---|
| **INTEGRATED CIRCUITS** | | 7 | IC005 | **OTHERS** | |
| 1 | IC001 MPU | 8 | IC801 | 12 | Tuner |
| 2 | IC6501 Comb Filter | **CONNECTORS** | | 13 | Fuse |
| 3 | IC101 VCJ | 9 | A22,A23 | 14 | Relay |
| 4 | IC 451 | 10 | A11 | 15 | D801 |
| 5 | IC 002 | **TRANSISTORS** | | 16 | T551 FBT |
| 6 | IC 811 COUPLER | 11 | Q551 | 17 | T801 |

# Identification of Main Components

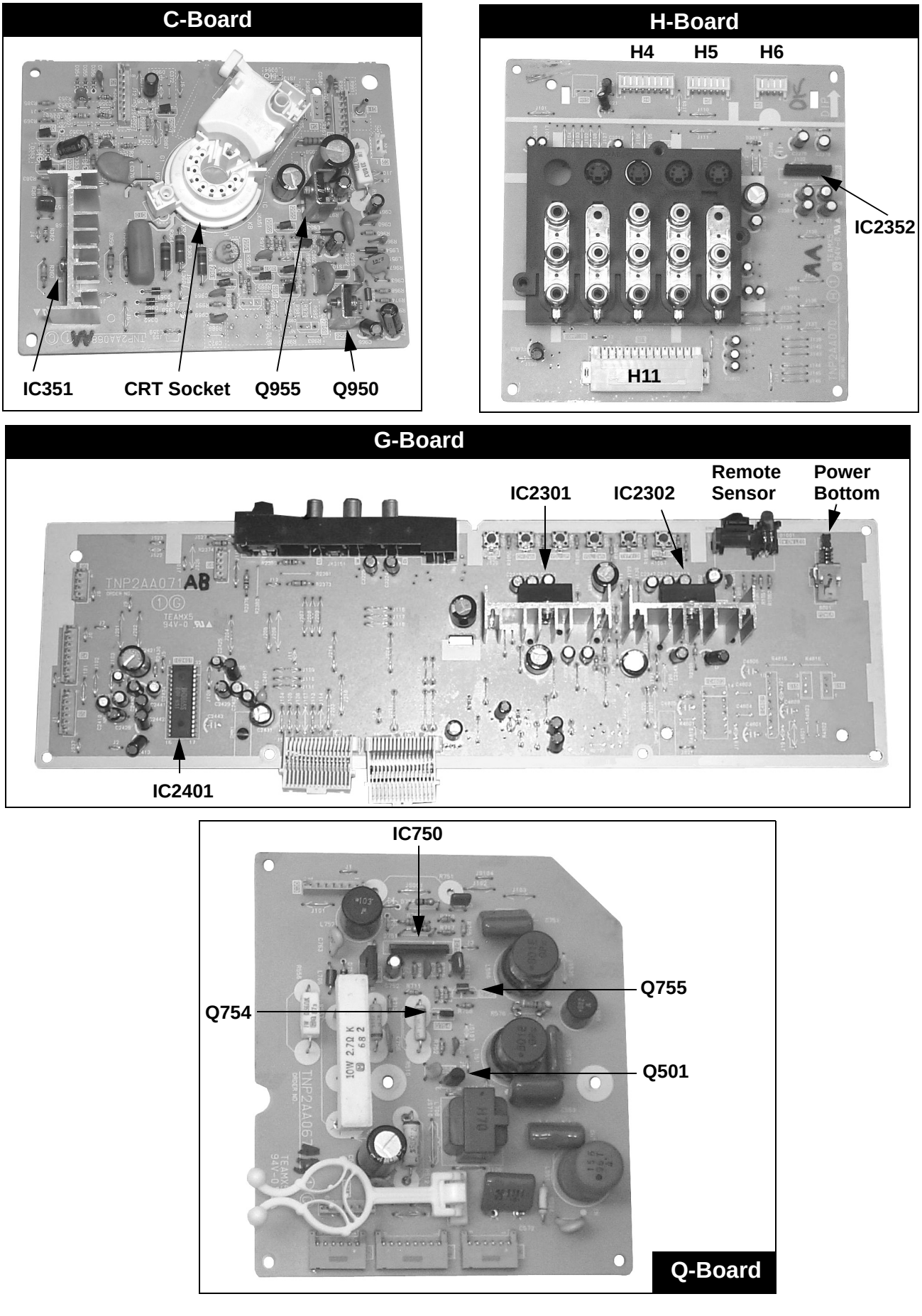



**Figure 9.** C, H, G and Q Board Main Components.

# Purity and Convergence Procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

1. Vertical Raster Shift Adjustment.
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

## When the CRT or the Yoke is Replaced

Place the yoke on the CRT neck (do not tighten the clamp).

Position purity/convergence assembly as shown and tighten clamp snugly. Remove the hot-melt glue seal on assembly and position like tabs of purity device together at 12 o'clock to reduce its magnetic field effect.

Place the vertical raster shift tabs at 3 o'clock (90º from the purity and convergence tabs, see Fig. 10 and Fig. 11*)*

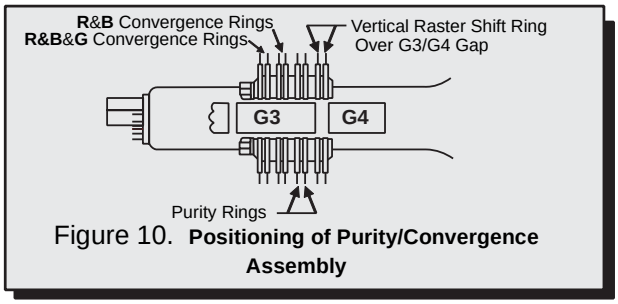



Figure 10. **Positioning of Purity/Convergence Assembly**

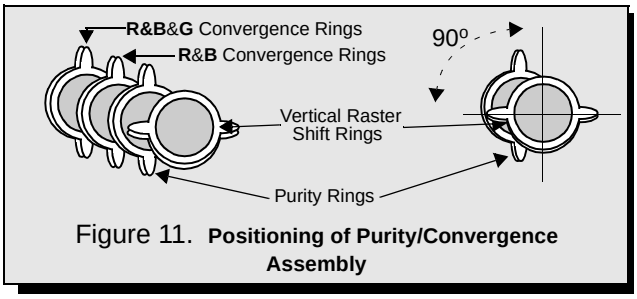



Figure 11. **Positioning of Purity/Convergence Assembly**

Turn the Receiver ON. Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT.

Fully degauss the Receiver by using an external degaussing coil.

Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

## Vertical Raster Shift Adjustment

Apply a green pattern with a horizontal line, adjust the Deflection Yoke so that has no tilt, then secure it.

Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce its magnetic field effect (see Fig. 10 and Fig. 11) open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT. (see Fig. 12)

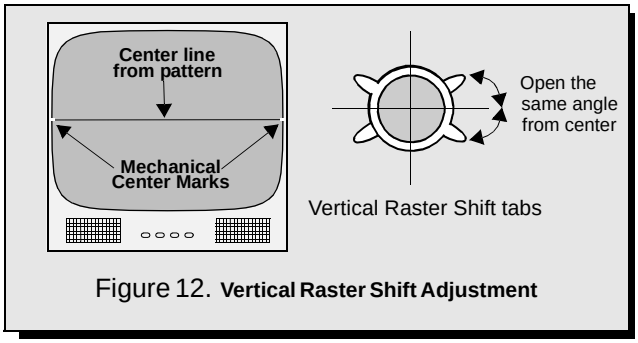



Figure 12. **Vertical Raster Shift Adjustment**

## Initial Center Static Convergence

Connect a dot/cross hatch generator to the Receiver and tune in a signal. Observe misconvergence at center of the screen only.

Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.

Adjust the R&B and R&B&G pole magnets: by separating tabs and rotating to converge blue and red (magenta) with green.

***Note:*** *Precise convergence at this point is not important.*

## Purity Adjustment

When the Receiver is in the Serviceman Mode for making electronic adjustments, press the **Recall** button on the Remote Control to enter Purity Check. (See the **Service Adjustments Electronic Controls** procedure).

Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT.

Fully degauss the Receiver by using an external degaussing coil.

Press the **Recall** button on the Remote Control again until the Purity Check (green screen) appears.

Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the Purity rings to set the vertical green raster precisely at the center of the screen (see Fig. 13).

NOTES:
1. CRT warm up with white screen (three guns activated) is needed to stabilize the shadow mask expansion.
2. Initial center static convergence (roughly centers three gun beams) is required in order to perform purity adjustment.

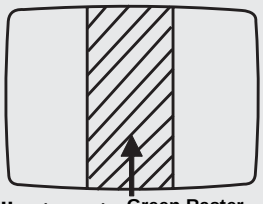



Figure 13. **Green Raster Adjustment**

Slowly move the deflection yoke forward until the best overall green screen is displayed.
Tighten the deflection yoke clamp screw.
Press the **Recall** button on the Remote Control again until the purity check (blue screen) and (red screen) appear and observe that good purity is obtained on each respective field.
Press the **Recall** button on the Remote Control again until Purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

## Final Convergence Procedure (see Fig. 14 through Fig. 16):

***Note:*** *Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the Receiver. The* ***Brightness*** *level should not be higher than necessary to obtain a clear pattern.*

Converge the red and the blue dots at the center of the screen by rotating the R&B pole Static Convergence Magnets.

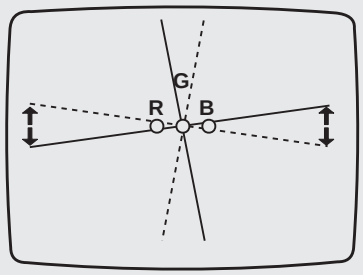
Align The converged red/blue dots with the green dots at the center of the screen by rotating the R&B&G pole Static Convergence Magnets. Melt wax with soldering iron to reseal the magnets.
Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.
If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Recheck for purity and readjust if necessary.
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.
Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

## Permalloy Convergence Corrector Strip (Part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.
First converge the set without the strip and observe the corners.

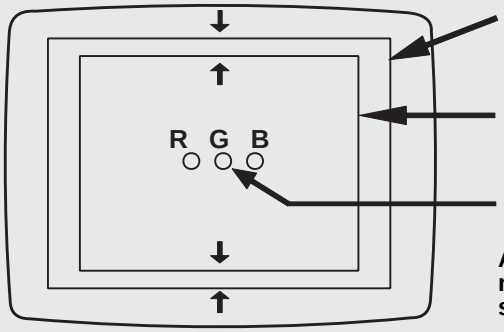
If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.




**As the yoke is tilted vertically, the rasters produced by the outside guns rotate in opposite directions.**

Figure 14. **Vertical Yoke Movement**




Raster produced from one of the outside electron beams

Raster from the other side electron beam

Static convergence magnets are set for center convergence

**As the yoke is tilted horizontally, one raster gets larger while the other gets smaller**

Figure 15. **Horizontal Yoke Movement**

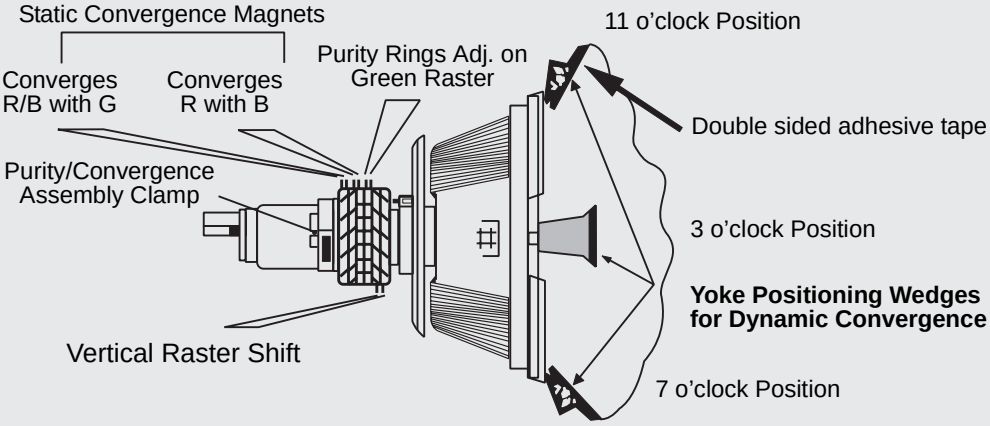
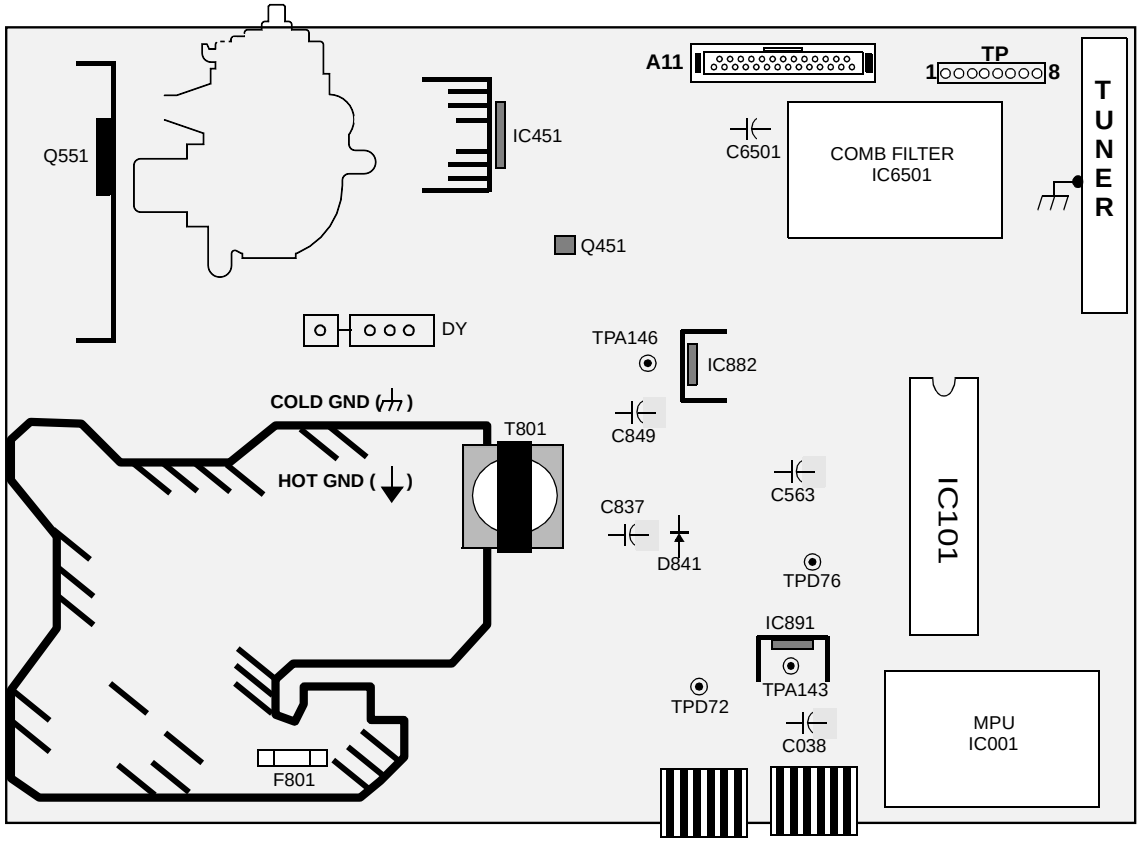



Figure 16. **Convergence Magnets and Wedges Location**

# Chassis Service Adjustment Procedures

**All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.**

***Note:*** *Connect the (-) lead of the voltmeter to the appropriate ground. Use IC801's heat sink when the HOT ground symbol ( ⏚ ) is used. Otherwise, use COLD ground ( ⏚ ) — Tuner shield, IC451's heat sink or FA2(TP-3).(See Fig. 8)*




## 140.0V B+ Voltage Confirmation

1. Set the **Bright**, **Picture and Color** to Minimum by using the Picture Menu.
2. Connect the DVM between C849, **+** side (A-Board) and cold ground (⏚).
3. Confirm that B+ voltage is **140.0V ± 1.5V**. This voltage supplies B+ to the Horizontal Output & Flyback circuits.

## Source Voltage Chart

120V AC line input. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu. Use cold (⏚) or Hot (⏚) ground for the (-) lead of the DVM as needed.

| LOCATION (A-Board) | VOLTAGE |
|---|---|
| **TPD72** | 24 ± 2 V DC |
| **C837 (+)** | 13.0 ± 2 V DC |
| **TPA143** | 9.0 ±1 V DC |
| **TPD76** | 12.0 ± 0.5 V DC |
| **TPA146** | 5.0 ± 0.25 V DC |
| **C6501 (+)** | 5.0 ± 0.25 V DC |
| **C038 (+)** | 3.3 ± 0.1 V DC |

Set all adjustments to normal level.

## High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust Brightness and Picture using Picture Icon menu so video just disappears.
3. Confirm B+ 140V is within limit.
4. Using a high voltage meter confirm that the High Voltage is **30.55kV ± 1.25kV for 25in models and 28.80kV ± 1.25kV for 20in models**.

## Deflection Circuit Preadjustment

**Preparation:**

1. Connect a High voltage meter (Capable of handle 50kV) to the CRT anode.
2. Connect the set to AC line and turn it on.

**Procedure:**

1. Apply a crosshatch pattern.
2. Set Picture Controls to minimum to obtain a black image.
3. Verify that the High Voltage meter reading is **30.55kV ± 1.25kV for 25in models and 28.80kV ± 1.25kV for 20in models**
4. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Set Picture Controls to normal.

# Serviceman Mode (Electronic Controls)

This Receiver has electronic technology using the I²C Bus Concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using "On Screen Display Menu". (The **Serviceman Adjustment Mode**.)

***Note:*** *It is suggested that the technician reads all the way through and understand the following procedure for Entering/Exiting the* ***Serviceman Adjustment Mode****; then proceed with the instructions working with the Receiver. When becoming familiar with the procedure, the Flow Chart for Serviceman Mode may be used as a quick guide.*

## Quick Entry to Serviceman Mode:

When minor adjustments need to be done to the electronic controls, the method of Entering the serviceman Mode without removal of the cabinet back is as follows using the Remote Control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIMER icon and set SLEEP time for 30 Min.
3. Press "ACTION" twice to exit menus.
4. Tune to the Channel 124.
5. Adjust VOLUME to minimum (0).
6. Press VOL ◀ (decrease) **on Receiver**. Red "CHK" appears in upper corner.

***Note:*** *After Receiver is set into SERVICEMAN mode, set TIMER back to NO.*

### To toggle between Aging and Serviceman modes:

While the "CHK" is displayed on the left top corner of the CRT, pressing "ACTION" and "VOL" UP on the TV simultaneously will toggle between the modes. Red "CHK" for Serviceman and yellow "CHK" for Aging.

7. **Press Power** on the **Remote Control** to select one of seven Serviceman Adjustment Modes.
   1. **B**= Serviceman VCJ SUB-DATA ADJUSTMENTS.
   2. **C**= Serviceman VCJ CUT-OFF ADJUSTMENTS.
   3. **D**= Serviceman GEOMETRIC ADJUSTMENTS.
   4. **S** = Serviceman S OPTION ADJUSTMENTS.
   5. **X** = Serviceman GEOMAGNETIC ADJUSTMENTS.
6. "**CHK**" = Normal operation of CHANNEL ▲▼ and VOLUME ◀ ▶.

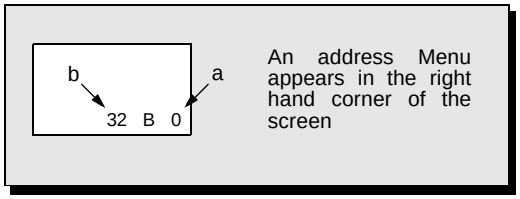



**Figure 17.** Serviceman Mode Menu Adjustments.

## Exiting the Serviceman Mode:

Press **Action** and **Power** on the **Receiver** simultaneously for at least 2 seconds.

**THE RECEIVER EXITS SERVICEMAN MODE.**

The Receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound. Any programmed channels, channels caption data and some others user defined settings will be erased.

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

## To Check Purity:

Press **Recall** on the **Remote Control** when in Serviceman Mode (red "CHK" is displayed) to enter the Purity Field Check Mode.

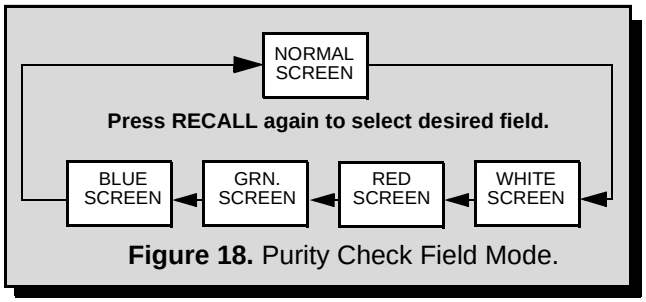



**Figure 18.** Purity Check Field Mode.

### Helpful Hints

**Entering Serviceman Mode (Back-Open Method)**

- While the Receiver is ON and operating in Normal Mode, momentarily short test point **FA1** (TP8) to Cold Ground ( ⏚ ) **FA2** (TP3) A-Board.

  ***The Receiver enters the Aging Mode***.
  Yellow letters "CHK" appear in the upper left corner of the CRT.
  (The Volume Up/Down will adjust rapidly).

**Press** the **Power Button** on the **Remote Control** to select the Serviceman Adjustment.

## For Adjustments:

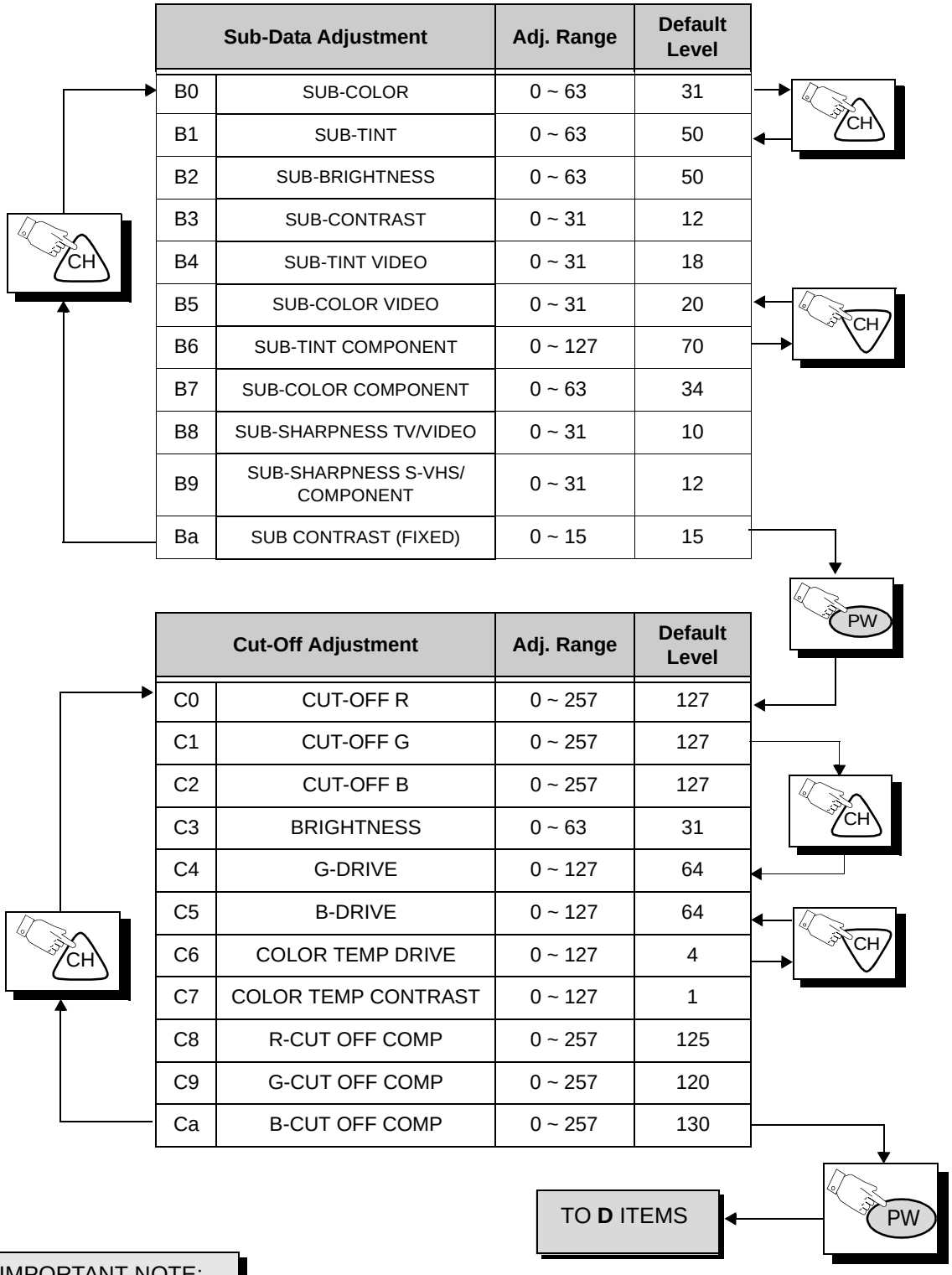
1. **Press Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (**a** in Fig. 17).

***Note:*** *Write Down the original value set (**b** in* Fig. 17*) for each address before modifying anything. It is easy to erroneously adjust the wrong item.*

2. **Press Volume Up/Down** on the **Remote Control** to adjust the level of the selected Service Adjustment (**b** in Fig. 17).

| Sub-Data Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| B0 | SUB-COLOR | 0 ~ 63 | 31 |
| B1 | SUB-TINT | 0 ~ 63 | 50 |
| B2 | SUB-BRIGHTNESS | 0 ~ 63 | 50 |
| B3 | SUB-CONTRAST | 0 ~ 31 | 12 |
| B4 | SUB-TINT VIDEO | 0 ~ 31 | 18 |
| B5 | SUB-COLOR VIDEO | 0 ~ 31 | 20 |
| B6 | SUB-TINT COMPONENT | 0 ~ 127 | 70 |
| B7 | SUB-COLOR COMPONENT | 0 ~ 63 | 34 |
| B8 | SUB-SHARPNESS TV/VIDEO | 0 ~ 31 | 10 |
| B9 | SUB-SHARPNESS S-VHS/ COMPONENT | 0 ~ 31 | 12 |
| Ba | SUB CONTRAST (FIXED) | 0 ~ 15 | 15 |

| Cut-Off Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| C0 | CUT-OFF R | 0 ~ 257 | 127 |
| C1 | CUT-OFF G | 0 ~ 257 | 127 |
| C2 | CUT-OFF B | 0 ~ 257 | 127 |
| C3 | BRIGHTNESS | 0 ~ 63 | 31 |
| C4 | G-DRIVE | 0 ~ 127 | 64 |
| C5 | B-DRIVE | 0 ~ 127 | 64 |
| C6 | COLOR TEMP DRIVE | 0 ~ 127 | 4 |
| C7 | COLOR TEMP CONTRAST | 0 ~ 127 | 1 |
| C8 | R-CUT OFF COMP | 0 ~ 257 | 125 |
| C9 | G-CUT OFF COMP | 0 ~ 257 | 120 |
| Ca | B-CUT OFF COMP | 0 ~ 257 | 130 |




IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

**Press** the **Power Button** on the **Remote Control** to select the Serviceman Adjustment.

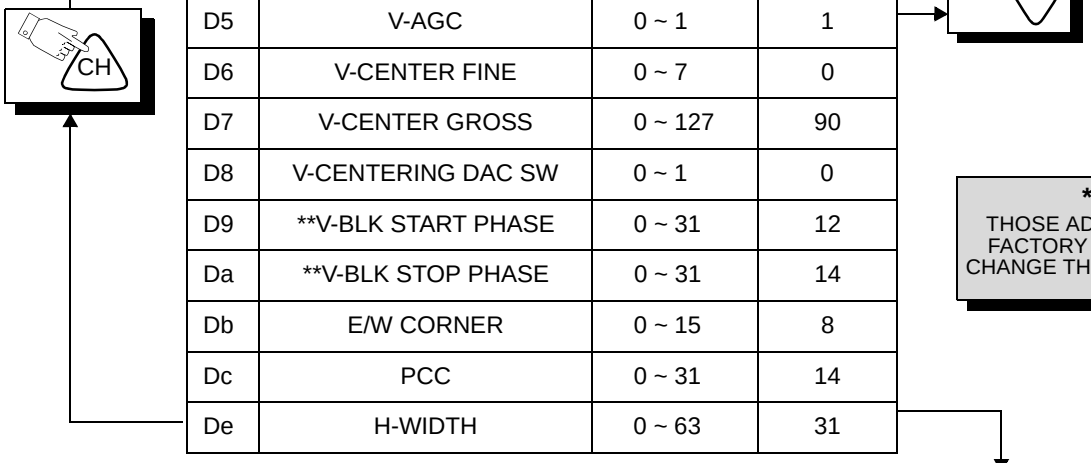
## For Adjustments:

1. **Press Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (**a** in Fig. 17).

***Note:*** *Write Down the original value set (**b** in* Fig. 17*) for each address before modifying anything. It is easy to erroneously adjust the wrong item.*

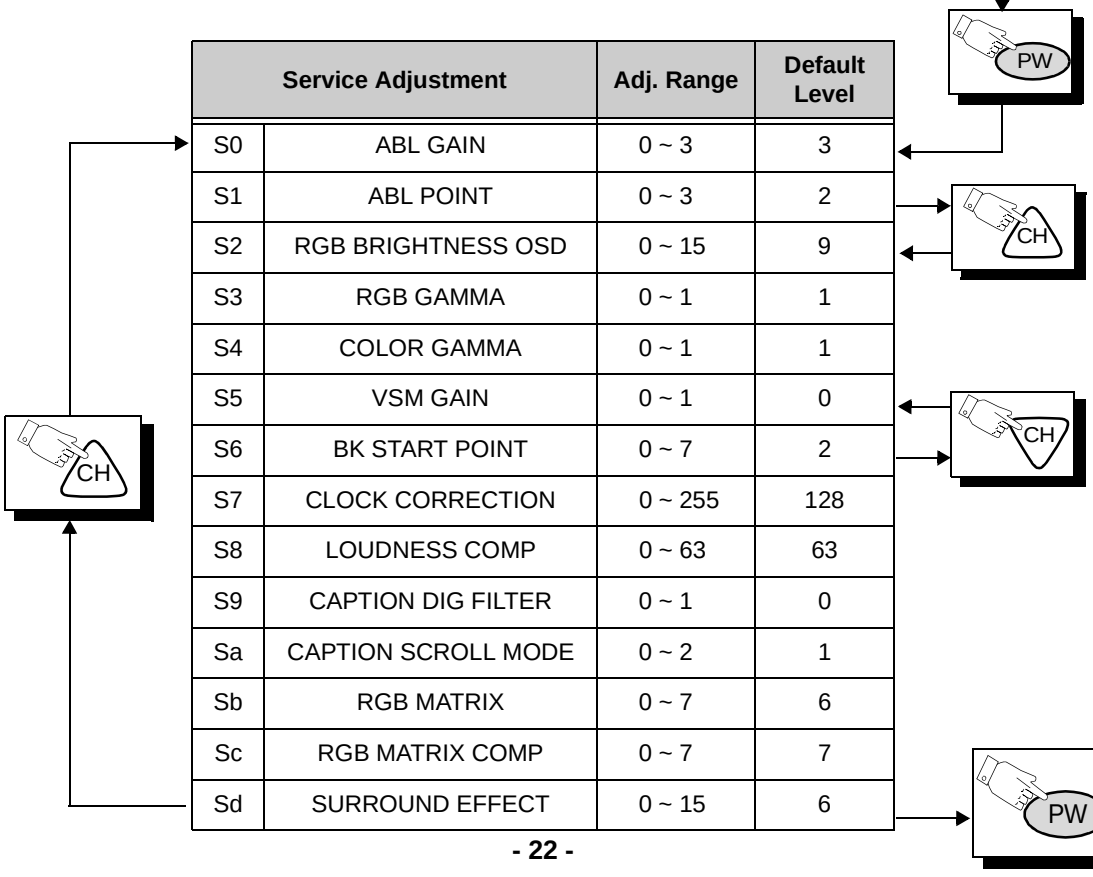
2. **Press Volume Up/Down** on the **Remote Control** to adjust the level of the selected Service Adjustment (**b** in Fig. 17).

| Geometric Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| D0 | H- POSITION | 0 ~ 31 | 16 |
| D1 | V-AMPLITUDE | 0 ~ 63 | 31 |
| D2 | V-S CORRECTION | 0 ~ 7 | 4 |
| D3 | V-LIN CORREECTION | 0 ~ 15 | 8 |
| D4 | E/W TRAPEZIUM | 0 ~ 15 | 11 |
| D5 | V-AGC | 0 ~ 1 | 1 |
| D6 | V-CENTER FINE | 0 ~ 7 | 0 |
| D7 | V-CENTER GROSS | 0 ~ 127 | 90 |
| D8 | V-CENTERING DAC SW | 0 ~ 1 | 0 |
| D9 | **V-BLK START PHASE | 0 ~ 31 | 12 |
| Da | **V-BLK STOP PHASE | 0 ~ 31 | 14 |
| Db | E/W CORNER | 0 ~ 15 | 8 |
| Dc | PCC | 0 ~ 31 | 14 |
| De | H-WIDTH | 0 ~ 63 | 31 |




****NOTE**
THOSE ADJUSTMENTS ARE FACTORY PRESET. DO NOT CHANGE THE ORIGINAL VALUE.

| Service Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| S0 | ABL GAIN | 0 ~ 3 | 3 |
| S1 | ABL POINT | 0 ~ 3 | 2 |
| S2 | RGB BRIGHTNESS OSD | 0 ~ 15 | 9 |
| S3 | RGB GAMMA | 0 ~ 1 | 1 |
| S4 | COLOR GAMMA | 0 ~ 1 | 1 |
| S5 | VSM GAIN | 0 ~ 1 | 0 |
| S6 | BK START POINT | 0 ~ 7 | 2 |
| S7 | CLOCK CORRECTION | 0 ~ 255 | 128 |
| S8 | LOUDNESS COMP | 0 ~ 63 | 63 |
| S9 | CAPTION DIG FILTER | 0 ~ 1 | 0 |
| Sa | CAPTION SCROLL MODE | 0 ~ 2 | 1 |
| Sb | RGB MATRIX | 0 ~ 7 | 6 |
| Sc | RGB MATRIX COMP | 0 ~ 7 | 7 |
| Sd | SURROUND EFFECT | 0 ~ 15 | 6 |



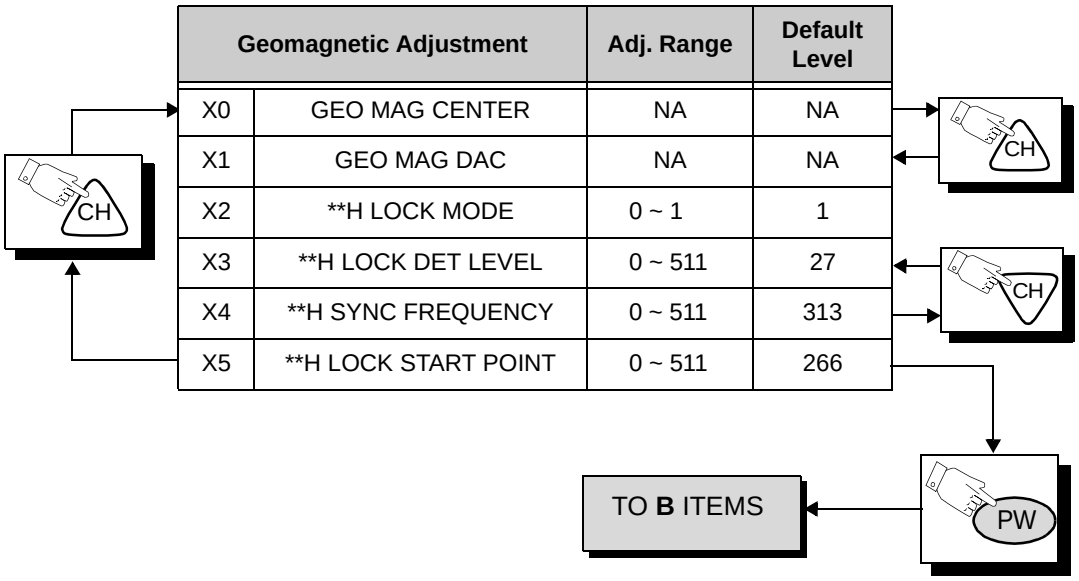
**Press** the **Power Button** on the **Remote Control** to select the Serviceman Adjustment.

## For Adjustments:

1. **Press Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (**a** in Fig. 17).

***Note:*** *Write Down the original value set (**b** in* Fig. 17*) for each address before modifying anything. It is easy to erroneously adjust the wrong item.*

2. **Press Volume Up/Down** on the **Remote Control** to adjust the level of the selected Service Adjustment (**b** in Fig. 17).




| Geomagnetic Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| X0 | GEO MAG CENTER | NA | NA |
| X1 | GEO MAG DAC | NA | NA |
| X2 | **H LOCK MODE | 0 ~ 1 | 1 |
| X3 | **H LOCK DET LEVEL | 0 ~ 511 | 27 |
| X4 | **H SYNC FREQUENCY | 0 ~ 511 | 313 |
| X5 | **H LOCK START POINT | 0 ~ 511 | 266 |

****NOTE**
THOSE ADJUSTMENTS ARE FACTORY PRESET. DO NOT CHANGE THE ORIGINAL VALUE.

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

## Instructional Flow Chart for Serviceman Mode

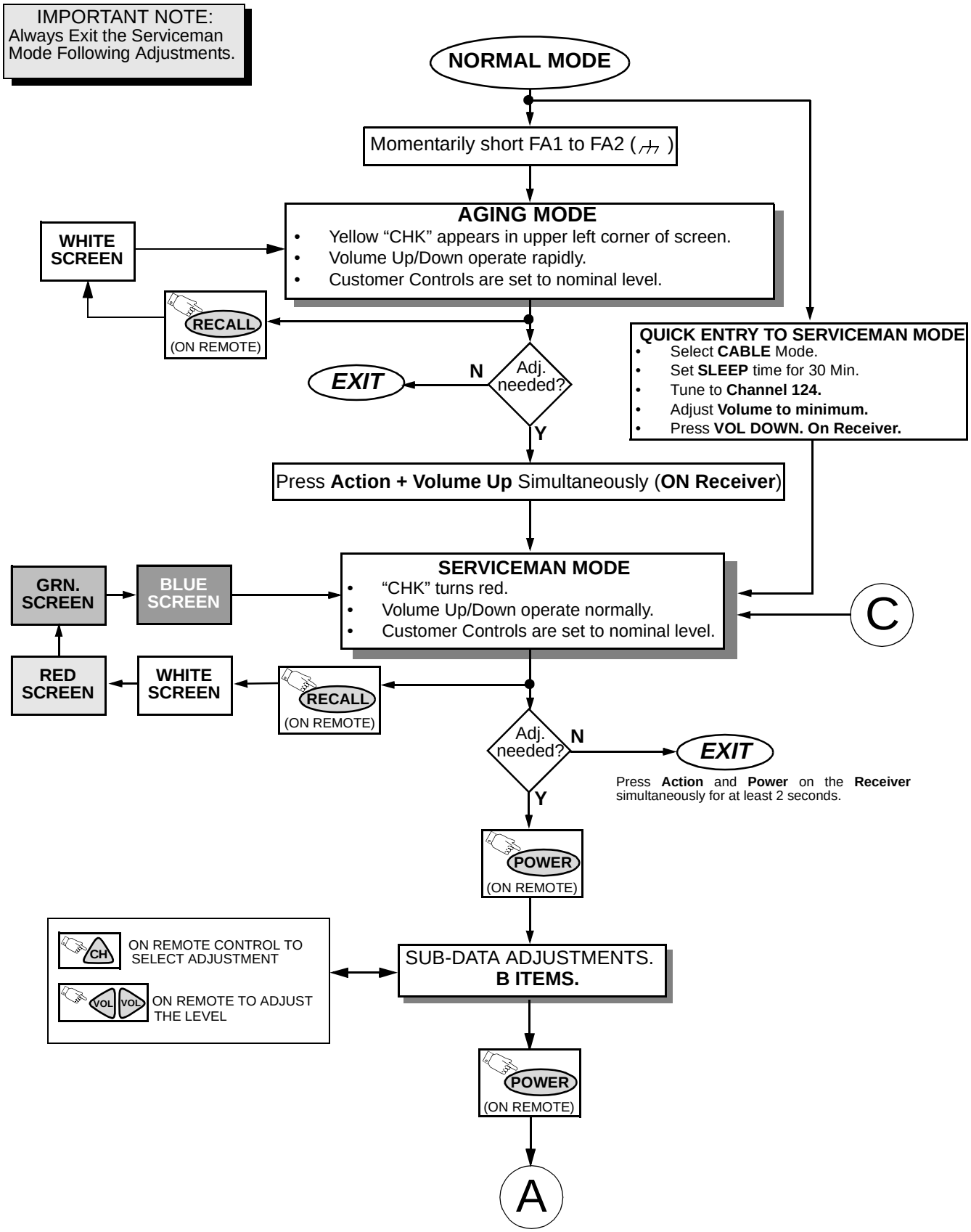



**Figure 19.**Flow Chart for Serviceman Mode.

## Instructional Flow Chart for Serviceman Mode - Continued

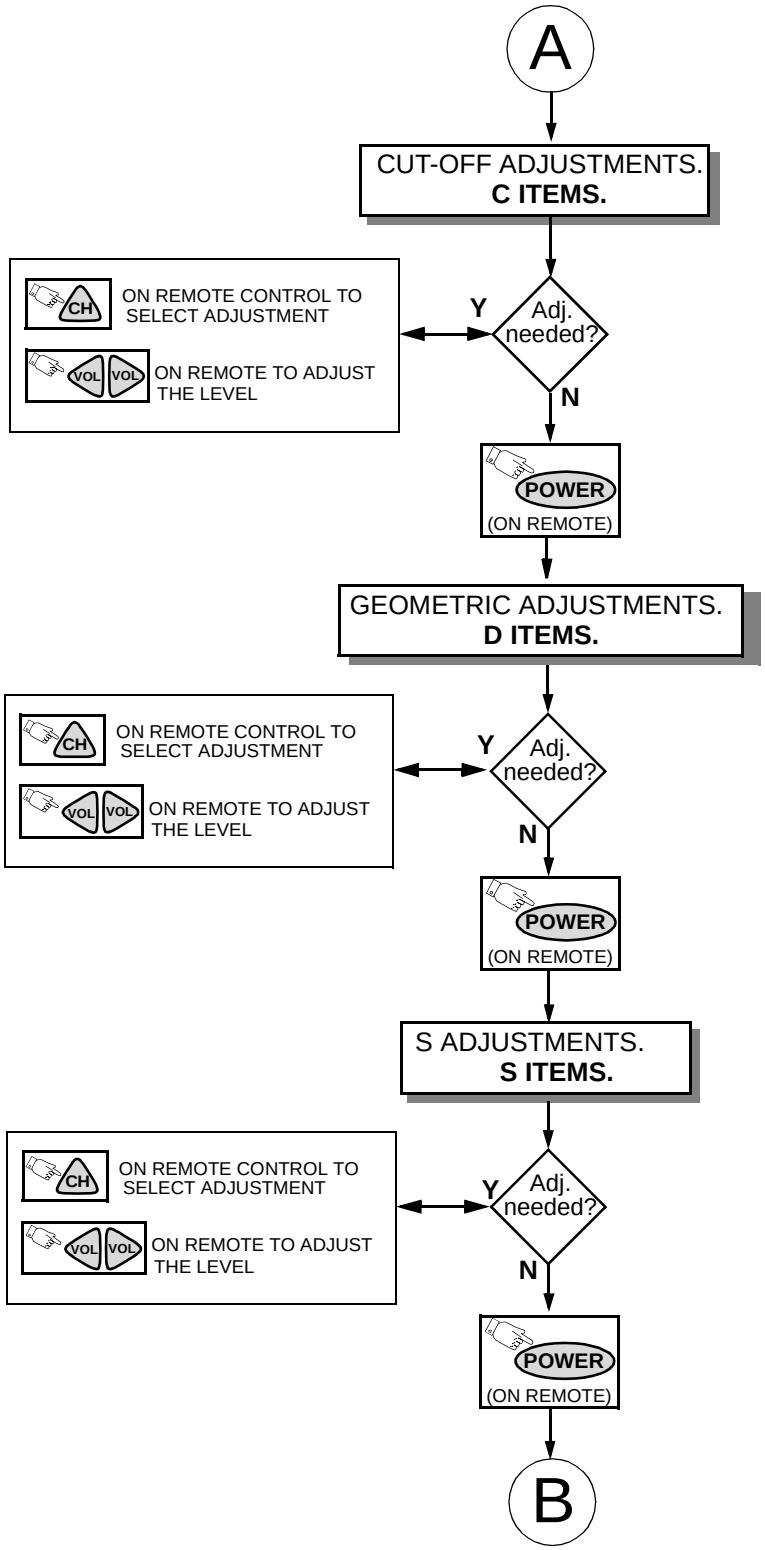
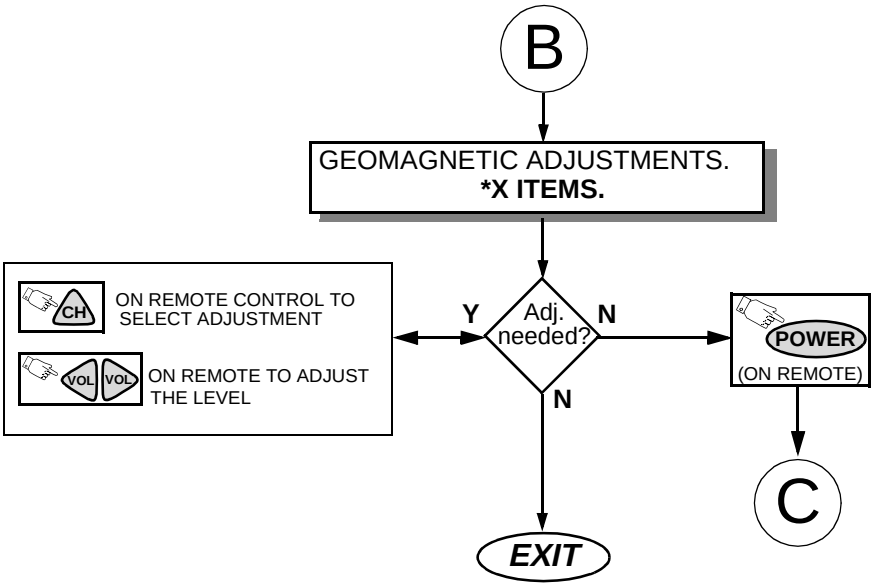



**Figure 20.** Flow Chart for Serviceman Mode (Continued).

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

## Instructional Flow Chart for Serviceman Mode - Continued




Press **Action** and **Power** on the **Receiver** simultaneously for at least 2 seconds.

***NOTE**

THOSE ADJUSTMENTS ARE FACTORY PRESET. DO NOT CHANGE THE ORIGINAL VALUE.
**X0 & X1** ARE NO APPLICABLE. REGISTERS HAVE NO EFFECT IN THE RECEIVER.

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

**Figure 21. Flow Chart for Serviceman Mode (Continued)**

# Service Adjustments (Electronic Controls)

***Note:*** *Turn the Receiver ON. Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT. Fully degauss the Receiver by using an external degaussing coil.*

## Sub-Brightness

**Serviceman DAC Adjustment (B2)**

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. This adjustment must be made after Sub-Contrast or Color Temperature adjustments are made. **Do not adjust** the SCREEN VR after the Sub-Brightness is set.

**Preparation:**

3. Preset the following controls:
   - Tint. . . . . .Center.
   - Color . . . . . .Center.
   - Picture . . . . . .Max.
4. Apply a Black and White cross pattern.
5. Operate the Receiver for a minimum of 30 minutes prior to performing this adjustment.

**Procedure:**

In the Serviceman Mode for making electronic adjustments, select the DAC adjustment (B2) and adjust until the 7.5 IRE part is the same light output as 3 IRE part.

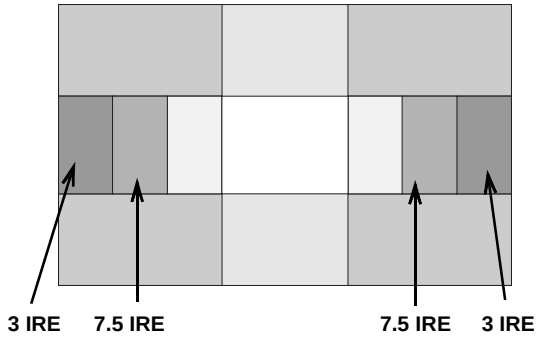



Figure 22. **Sub-Bright Pre adjustment**

*You may set the accurate value following the Preparation steps and the Procedure step No. 1 of the Sub-Contrast adjustment described below.*

## Sub-Contrast

**Serviceman DAC Adjustment (B3)**

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

**Preparation:**

1. Apply a color bar signal pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black.

***Note:*** *The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to the pattern used if another signal is used.*

2. Preset the following controls:
   - Brightness . . . . . .Center.
   - Color . . . . . .Min.
   - Picture . . . . . .Max.
   - Sharpness . . . . . .Center.
3. Set RGB Gamma Register OFF (S3 to 0)
4. Connect the oscilloscope to TP47R (A-Board, below IC101).
5. Set the scope time base to 20μs (horizontal).
6. Connect a jumper from TPD2 to ground (⏚).

**Procedure:**

1. In the Serviceman Mode, select DAC Sub-Brightness Adjustment (B2) and adjust for **1.5~1.9Vp-p** between blanking and 7.5 IRE level.

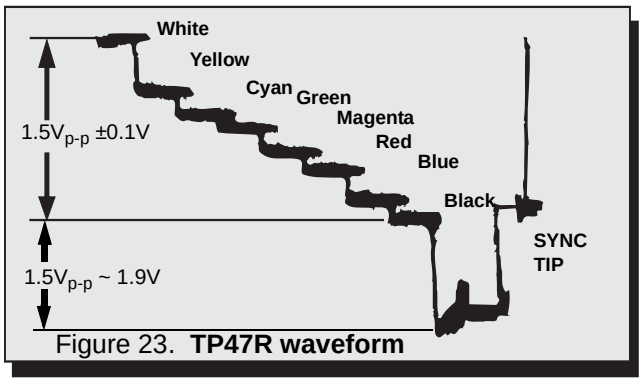



Figure 23. **TP47R waveform**

2. In the Serviceman Mode for electronic adjustments, select DAC Sub-Contrast Adjustment (B3) and adjust for **1.5Vp-p ± 0.1V** from white level to black level on video waveform (see video waveforms detail, Fig. 23).
3. Remove the jumpers (Preparation step 6).
4. Set S3 to 1.

## Tint/Color Adjustment

**Serviceman DAC Adjustment (B1) (B0)**

**Preparation:**

1. Preset the following controls:)
   - Tint. . . . . Center.
   - Color . . . . . Center.
   - Picture . . . . . Max.
   - Sharpness . . . . . Min.
   - Bright . . . . . Min.
   - Color Temp . . . . . Normal.
2. Set RGB Gamma Register OFF (S3 to 0).
3. Connect a jumper from TPD2 to ground (⏚).

# Service Adjustments (Electronic Controls, cont.)

**Procedure:**
1. Apply a Color bar pattern.
2. Connect oscilloscope to TP47B (Blue Output) in A-board, below IC101.
3. Select DAC **Sub-Tint (B1)** and adjust waveform so that peaks 7 is halfway between peaks 5 and 6 as shown in Fig. 24

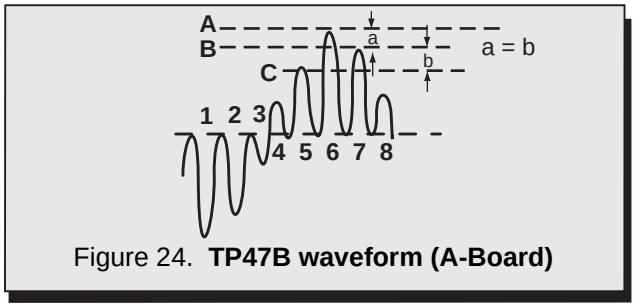


Figure 24. **TP47B waveform (A-Board)**

4. Connect oscilloscope to TP47R (Red Output), in A-Board, below IC101.
5. Select DAC **Sub-Color B(0)** and adjust for waveform to measure **1.3V ± 0.05Vp-p**, See Fig. 25

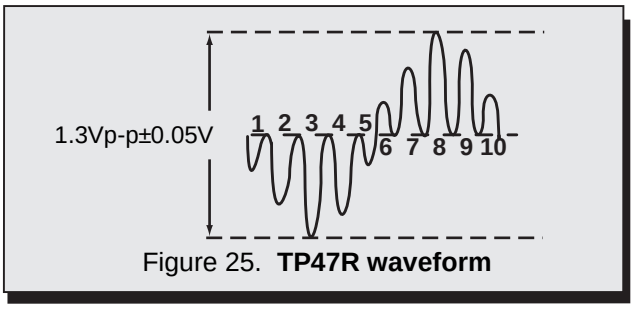


Figure 25. **TP47R waveform**

6. Remove jumpers (Preparation step 3).
7. Set DAC **S3 to 1.**
8. Confirm that the phase can be changed about ± 30$^{o}$ by TINT CONTROL. (Tint ratio AB=1, AC=2).

## Color Temperature Adjustment (B/W Tracking)

**Serviceman DAC Adjust. (C0) (C1) (C2) (C4) (C5)**
**Minor Touch-Up Method**

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good gray scale and warm highlights".

1. LOW LIGHT areas – In Serviceman Mode for making electronic adjustments, select Cutoff (C0) RED, (C1) GRN, (C2) BLU and adjust the picture for gray.
2. HIGH LIGHT areas – In Serviceman Mode for making electronic adjustments, select Drive (C4) GREEN, (C5) BLUE and adjust the picture for warm whites.

## Complete Adjustment

**Preparation:**
1. Turn the Receiver "ON" and allow 45 minutes warm up at high brightness.
2. Apply a color bar signal with color "OFF".
3. Set Picture Icon Menu Video controls to Normalize.
4. Turn the SCREEN control (part of FBT T551) fully counterclockwise.
5. Set Service Switch On:
   Connect a jumper from Q451 (Base) to R812 +5V side. (TPA146 or IC882-3)
6. Preset the following Serviceman DACs for best results:
   - Red Cut-Off **C0** . . .128
   - Green Cut-Off **C1** . . .128
   - Blue Cut-Off **C2** . . .128
   - Green Drive **C4** . . . . 64
   - Blue Drive **C5** . . . . 64

**Procedure:**
1. Connect the oscilloscope to TP47R.
2. In Serviceman Mode for making electronic adjustment, select the Sub-Bright DAC (B2).
3. Observe oscilloscope waveform and adjust serviceman mode **Sub-Bright** DAC **(B2)** until **2.5V** above DC ground is measured (See Fig. 26)

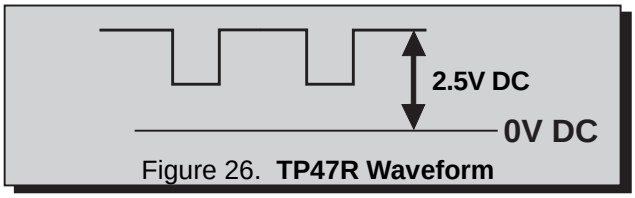


Figure 26. **TP47R Waveform**

4. Connect scope to RED Cathode (KR) on CRT-Board
5. In Serviceman mode for making electronic adjustments, select **RED CUTOFF** DAC **(C0)**
6. View scope trace at Horizontal rate and adjust Serviceman Mode DAC **(C0)** for the scanning period to be **170V for 25in models and 160V for 20in models** above DC ground (See Fig. 27.)

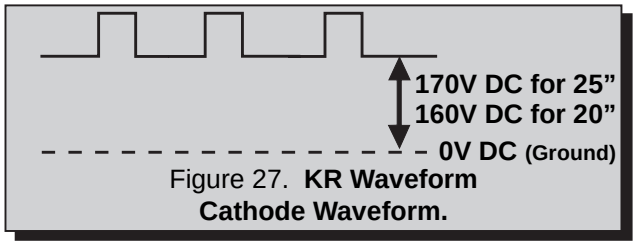


Figure 27. **KR Waveform**
**Cathode Waveform.**

7. Write the same data (C0 register value) to Green **C1** and Blue **C2**.
8. Turn SCREEN VR (Part of FBT) slowly clockwise until a faint horizontal line in color appears.
9. Using the Serviceman Mode Dac CUTOFF adjustments, increase their setting to produce a white horizontal line.
10. Confirm a good gray scale by viewing B/W color bar Pattern.
11. If correction is needed perform **Minor Touch-Up Method.**
12. Perform **Sub-Brightness** adjustment procedure if needed.

# Service Adjustments (Electronic Controls, cont.)

***Note:*** *Turn the Receiver ON. Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT. Fully degauss the Receiver by using an external degaussing coil.*

## Horizontal Center Adjustment

**Serviceman DAC Adjustment (D0)**

**Preparation:**

1. Preset the following controls:)
   - Picture . . . . . Max.
   - Bright . . . . . Center.

**Procedure:**

1. Apply a monoscope pattern.
2. Adjust Horizontal center register to center the monoscope pattern on the CRT.

## E-W Pincushion Correction

**Serviceman DAC Adjustment (Dc)**

**Preparation:**

1. Apply a Crosshatch pattern
2. Normalize the Picture Icon Video adjustments.
3. Set:
   - Brightness . . . . . .Center.
   - Sharpness . . . . . .Center
   - Picture . . . . . .Max.

**Procedure:**

1. Enter Serviceman Mode, select DAC **Dc**. Adjust for 1st and 3rd vertical lines on E&W sides to be straight (See Fig. 28)

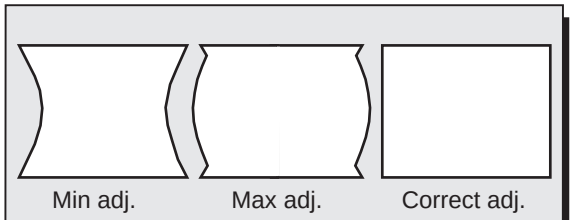



Figure 28. **E-W Pincushion Adjustment**

2. Select DAC **Db** and adjust vertical lines so that the top edge is straight (SeeFig. 29)

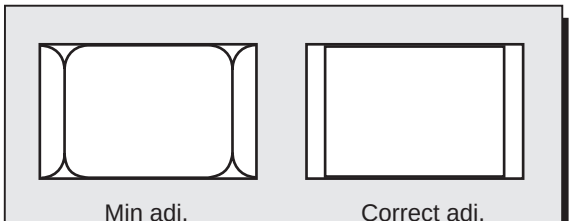



Figure 29. **Corner Pincushion Adjustment**

## Horizontal Width Adjustment

**Serviceman DAC Adjustment (Dd)**

**Preparation:**

1. Apply a monoscope pattern.
2. Adjust **D0 Horizontal Center** until picture is centered.
3. Verify Horizontal Width is in normal range.
4. Apply a crosshatch pattern.
5. Adjust **Dc, E-W Pincushion** and **Db, Corners Pincushion** to obtain outside vertical lines as straight as possible.

**Procedure:**

1. Apply a monoscope pattern.
2. Adjust **Dd, Horizontal Width** until distance **A = B** (4.50 ± 0.40 aprox.) See Fig. 30.
3. Adjust **Vertical Size** to obtain a complete round pattern.

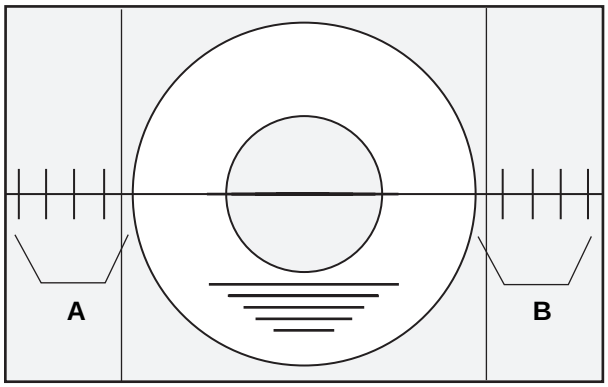



Figure 30. **Horizontal Size Adjustment**

## Vertical Position, Vertical Size

**Serviceman DAC Adjustment (D6, D1)**

**Preparation:**

1. Apply a monoscope pattern.

**Procedure:**

1. Adjust **D7 Vertical Position** until picture is centered with the vertical center of the CRT. Use **D6** for fine adjustment.
2. Adjust **D1, for Vertical Size** to obtain a round monoscope pattern; distance **C = D.** See Fig. 31.

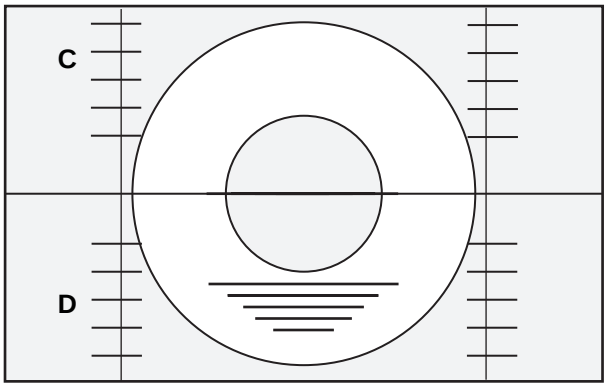



Figure 31. Vertical size adjustment

# Service Adjustments (Electronic Controls, cont.)

## Vertical Linearity adjustment

**Serviceman DAC Adjustment (D3)**

**Preparation:**

1. Apply a crosshatch pattern.

**Procedure:**

1. Adjust **D3 Vertical linearity** so that distance **A = B**. See Fig. 32.

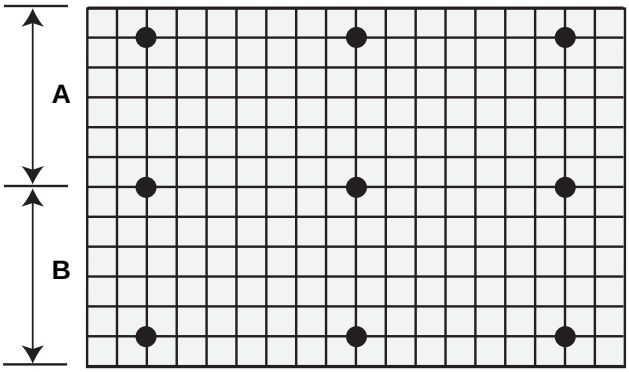



Figure 32. **Vertical Linearity**

To make a correlation of the Vertical Size from monoscope pattern, after Adjust **HORIZONTAL CENTER, HORIZONTAL WIDTH, VERTICAL POSITION AND SIZE** to obtain a complete round picture, mark the points as shown in Fig. 33 and use them as a reference in Linearity adjustment.

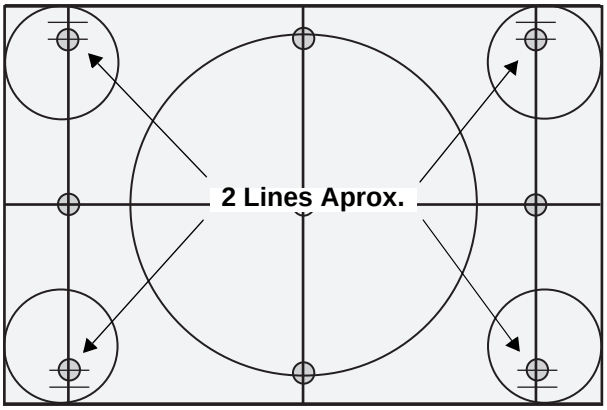



Figure 33. **Points for Correlation**.

## Vertical Correction Adjustment

**Serviceman DAC Adjustment (D2)**

**Preparation:**

1. Apply a crosshatch pattern.
2. Adjust V-Size (**D1**) to obtain a regular size. (Confirm with monoscope pattern a complete round picture)

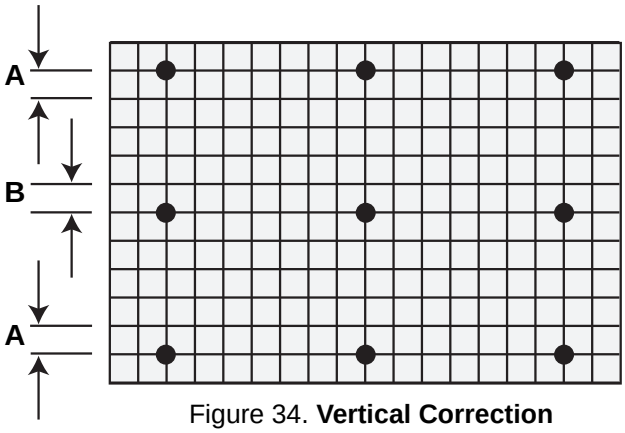



Figure 34. **Vertical Correction**

**Procedure:**

1. If **B-A < -1.5mm**. See Fig. 34.

- Increase the value in D2 V-S Correction one step.
- Adjust **D1 V-Size** to keep picture proportions (Confirm with monoscope pattern a complete round picture).
- Repeat above steps until **B-A ≤ 1.5mm.**

2. If **B-A > -1.5mm.** See Fig. 34.

- Decrease **D2** value one step.
- Adjust **D1 V-Size** to keep picture proportions (Confirm with monoscope pattern a complete round picture).
- Repeat above steps until **B-A ≤ 1.5mm**.

## MTS Circuit Confirmation

Audio levels (MTS Circuit) are factory preset, confirm output levels. If are not within the range, replace the Tuner, refer to parts list in this manual for part number.

### Output Level Confirmation

**Preparation:**

1. Connect an RMS meter with filter jig as shown in Fig. 35.

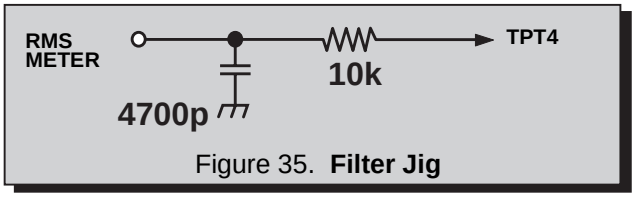



Figure 35. **Filter Jig**

2. Connect an RF signal generator to the RF antenna input.

# Service Adjustments (Electronic Controls, cont.)

**Procedure**:

1. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 100% modulation, monaural (70 ±5dB, 75Ω OPEN, P/S 10dB). Make sure that the 75μs pre-emphasis is OFF.
2. Confirm MTS Output level on TPT4 on the RMS is **530 ± 20.0mV rms**.

## Stereo Separation Confirmation

**Preparation:**

1. Connect an RF signal generator to the RF antenna input.
2. Connect the scope to TPT3 for Right output.
3. Connect the scope to TPT4 for Left output

**Procedure:**

1. Select Stereo Mode in Audio menu
2. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 30% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
3. Confirm MTS stereo separation between Left and Right is minimum 20db.
4. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 3KHz, 30% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
5. Confirm MTS stereo separation between Left and Right is minimum 20db.

# Audio Signal Path Block Diagram

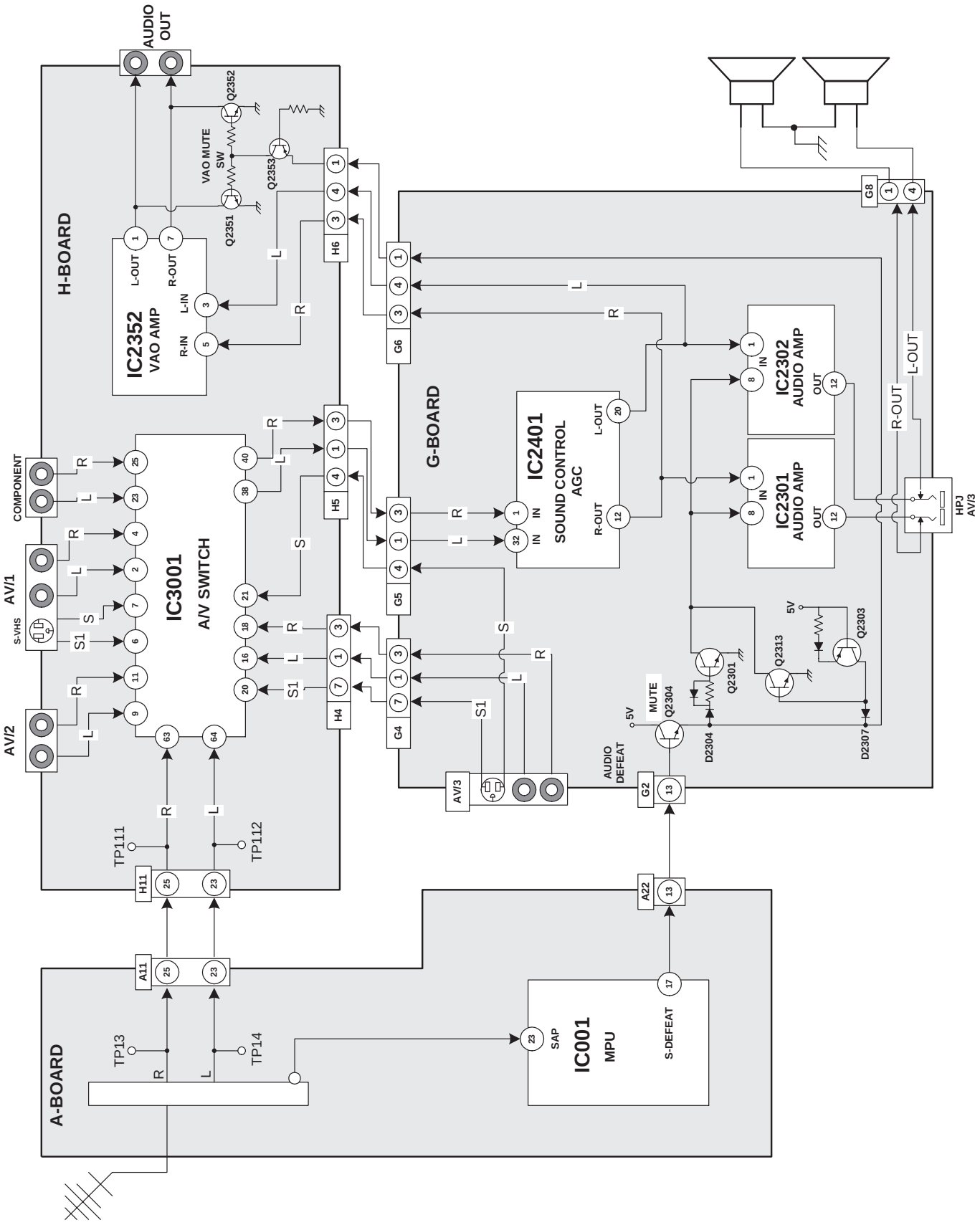



**Figure 36.** Audio Signal Path Block Diagram.

# Video-Chroma Signal Path Block Diagram

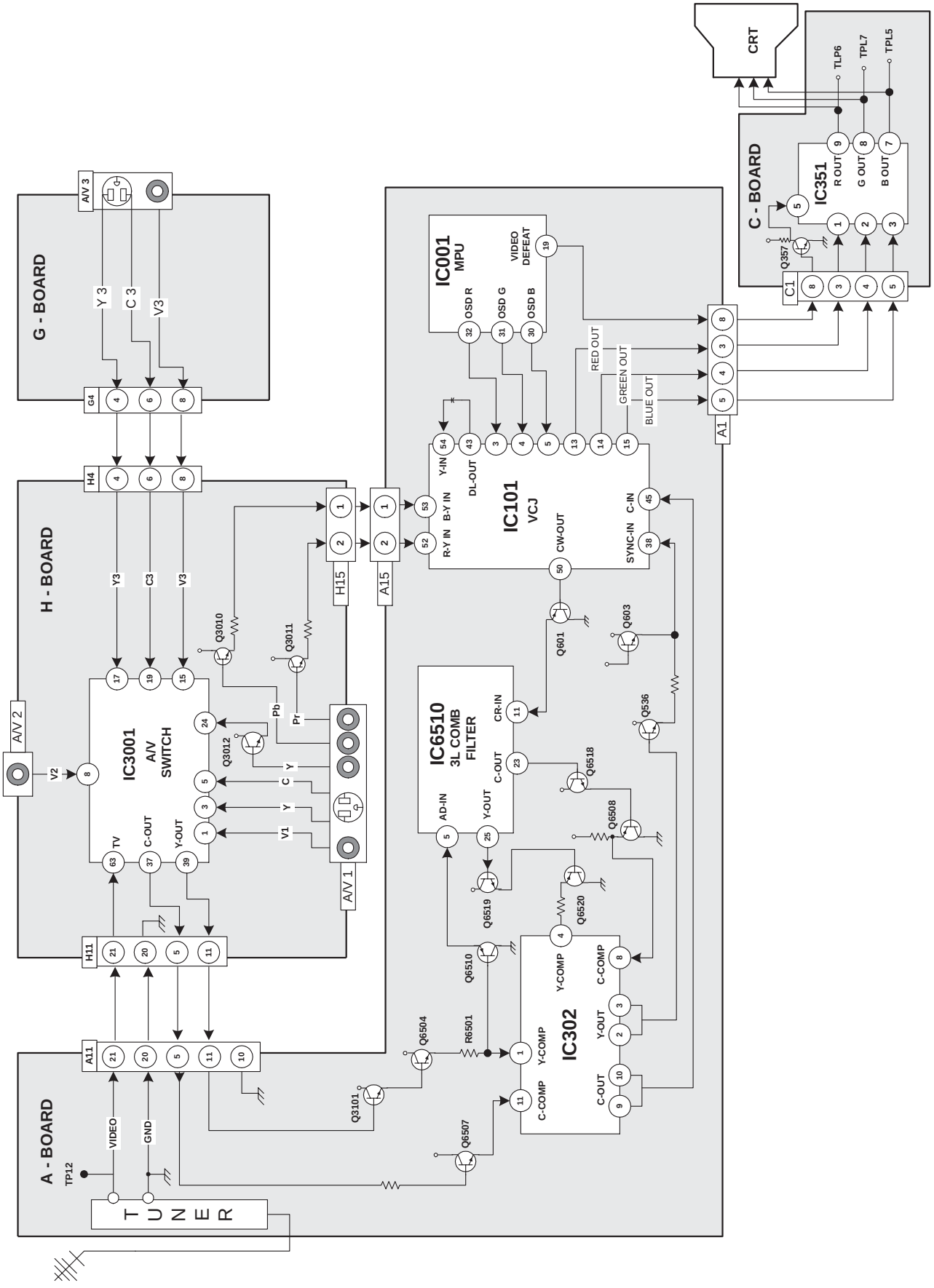



**Figure 37.** Video-Chroma Signal Path Block Diagram.

# IC001 MPU
# IN/OUT Pins and Functions

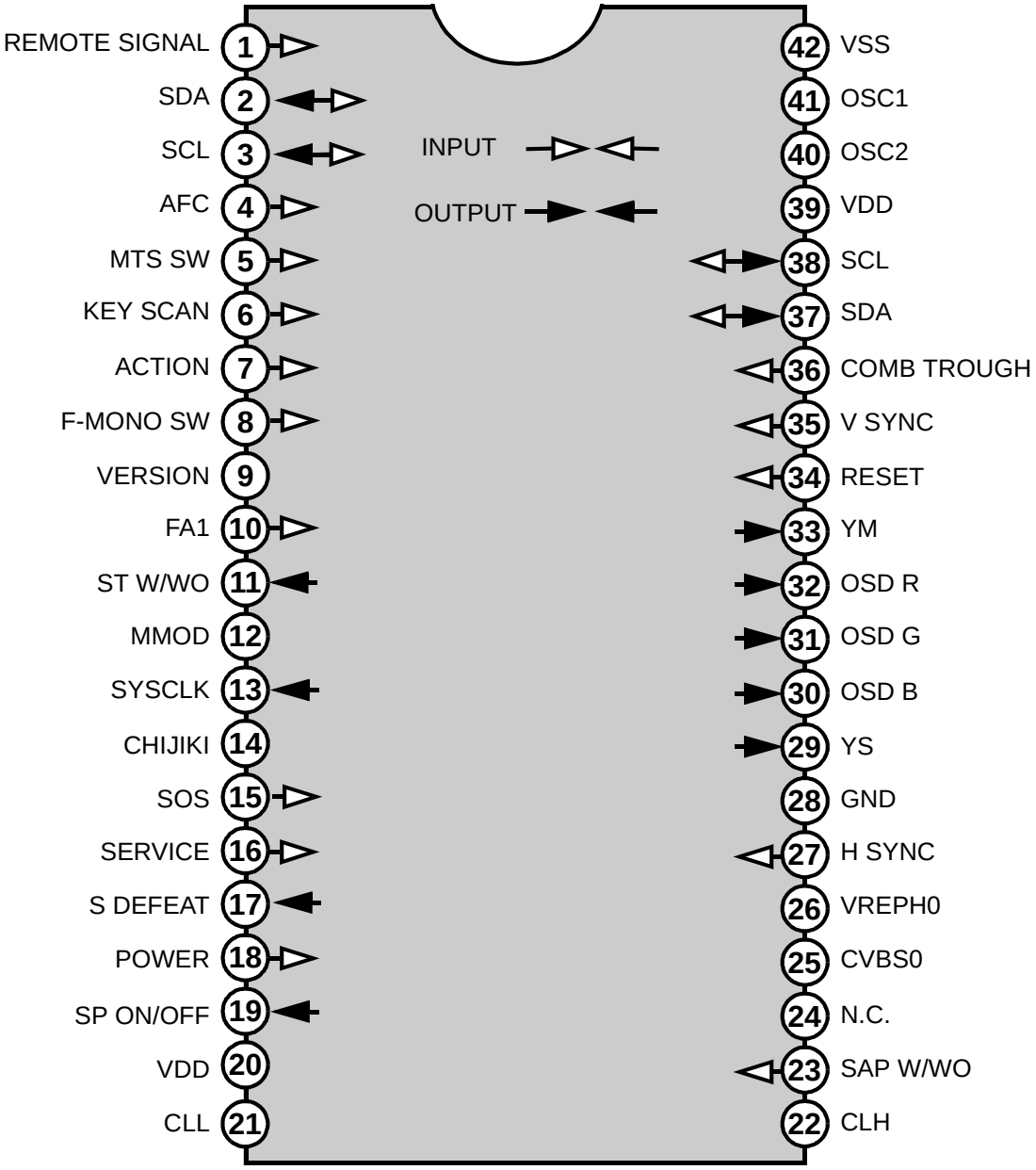



**Figure 38.** MPU IN/OUT Pins and Functions.

# IC101 VCJ
# IN/OUT Pins and Functions

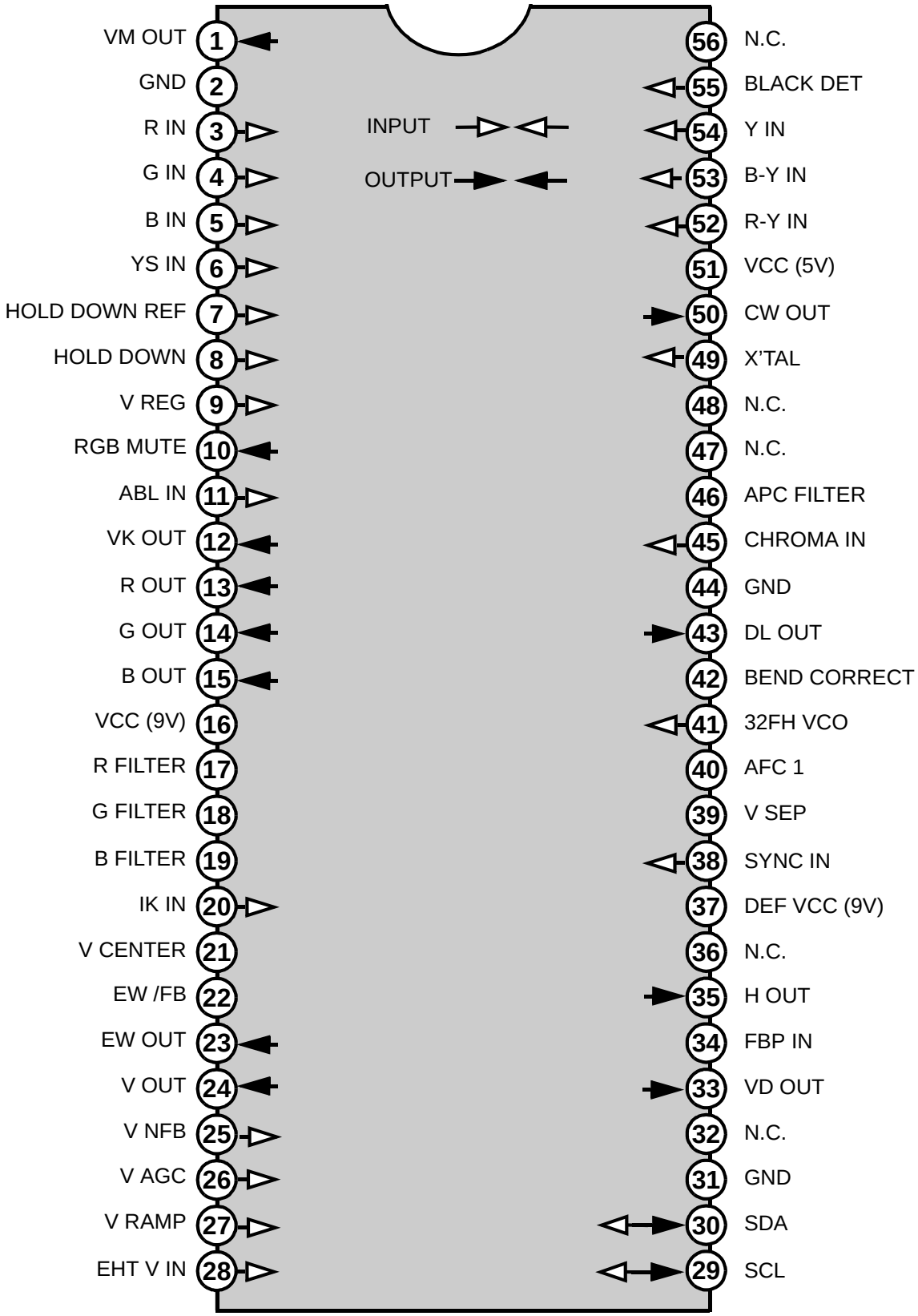



**Figure 39.** VCJ IN/OUT Pins and Functions.

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| | ***CAPACITORS*** | |
| C002 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C006 | ECA1HM100B | CAP,E 10UF/50V |
| C016 | ECA1HM010B | CAP,E 1UF-50V |
| C018 | ECJ2VC1H101J | CAP,C 100PF-J-50V |
| C019 | ECJ2VC1H220J | CAP,C 22PF-J-50V |
| C020 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C022 | ECJ2VC1H220J | CAP,C 22PF-J-50V |
| C026 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C030 | ECA0JM102B | CAP,E 1000UF-6.3V |
| C033 | ECJ2VF1H104Z | CAP,C .1UF-Z-50V |
| C034 | ECA1CM101B | CAP,E 100UF/16V |
| C036 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C038 | ECA0JM102B | CAP,E 1000UF-6.3V |
| C040 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C041 | ECA1HMR22B | CAP,E .22UF-50V |
| C042 | ECA1HM2R2B | CAP,E 2.2UF-50V |
| C043 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C044 | ECKR1H103ZF5 | CAP,C .01UF-Z-50V |
| C045 | ECA1VM470B | CAP,E 47UF/35V |
| C046 | ECA1CM470B | CAP,E 47UF/16V |
| C047 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C048 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C049 | ECA1CM101B | CAP,E 100UF/16V |
| C050 | ECA1CM101B | CAP,E 100UF/16V |
| C301 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C302 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C303 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C310 | ECJ2VC1H390J | CAP,C 39PF-J-50V |
| C315 | EEANA1E1R0B | CAP,E 1.0UF-25V |
| C351 | TACCV470T50V | CAP,C 47PF/50V |
| C353 | TACCV330T50V | CAP,C 33PF/50V |
| C358 | TACCW101T50V | CAP,C 100PF/50V |
| C359 | ECQM4104KZB | CAP,P .10UF-K-400V |
| C368 | ECQV1H224JZ3 | CAP,P .22UF-J-50V |
| C370 | ECKW3D102KBN | CAP,C .001UF-K-2KVDC |
| C371 | ECEA1HN010UB | CAP,E 1UF/50V |
| C373 | ECA2EHG100B | CAP,E 10UF-25V |
| C377 | ECA1CM221B | CAP,E 220UF-16V |
| C401 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C402 | ECJ2VB1C104K | CAP,C .1UF-K-16V |
| C403 | ECA1HM010B | CAP,E 1UF-50V |
| C404 | ECSF1EE105VB | CAP,E 1.0UF-25V |
| C405 | ECA1HM220B | CAP,E 22UF-50V |
| C407 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C453 | EEUNA1E220B | CAP,E 22UF-25V |
| C454 | ECA1HHG221B | CAP,E 220UF-50V |
| C456 | ECQB1104JF3 | CAP,P .10UF-J-100V |
| C458 | ECKR1H221KB5 | CAP,C 220PF-K-50V |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C459 | ECQB1224KF3 | CAP,P .22UF-K-100V |
| C460 | ECA1VM221B | CAP,E 220UF-35V |
| C461 | ECA1VM470B | CAP,E 47UF/35V |
| C462 | ECA1VM221B | CAP,E 220UF-35V |
| C463 | ECQB1H103JM3 | CAP,P .01UF-J-50V |
| C465 | ECA1CM101B | CAP,E 100UF/16V |
| C470 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C471 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C491 | ECKR2H471KB5 | CAP,C 470PF-K-500W |
| C493 | ECKR2H471KB5 | CAP,C 470PF-K-500W |
| C495 | ECQB1H683JM3 | CAP,P .068UF-J-50V |
| C497 | ECA1EM102B | CAP,E 1000UF-25V |
| C498 | ECA1EM102B | CAP,E 1000UF-25V |
| C511 | ECKR2H271KB5 | CAP,C 270PF-K-500W |
| C535 | ECJ2VC1H120J | CAP,C 12PF-J-50V |
| C550 | ECA160V33UE | CAP,E 33UF/160V |
| **C551** | **ECWH12H103JS** | **CAP,P .01UF-J-1.2KV** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **C551** | **ECWH20562JVB** | **CAP,P 5600PF-J-2KV** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **C552** | **ECQM4273JZW** | **CAP,P .027UF-J-400V** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **C552** | **ECQM4473JZW** | **CAP,P .047UF-J-400V** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **C553** | **ECWF2364JBB** | **CAP,P .36UF-J-200V** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **C553** | **ECWF2684JSR** | **CAP,P .26UF-J-200V** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **C554** | **ECKW3D102KBR** | **CAP,C 1000PF-K-2KV** |
| C555 | ECA160V33UE | CAP,E 33UF/160V |
| **C556** | **ECWH20122JVY** | **CAP,P 1200PF-J-2KV** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **C556** | **ECWH20562JVY** | **CAP,P 5600PF-J-2KV** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| C557 | ECA1HM100B | CAP,E 10UF/50V |
| **C558** | **ECKW3D561KBR** | **CAP,C 560PF-K-2KV** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **C558** | **ECKW3D681KBR** | **CAP,C 680PF-K-2KV** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| C559 | ECKW3D681KBP | CAP,C 680PF-K-2KV |
| C561 | ECQB1H273JM3 | CAP,P .27UF-J-50V |
| **C562** | **ECKW3D102JBR** | **CAP,C 1000PF-J-2KV** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| **C563** | **ECWH16332JVY** | **CAP,P 3300PF-J-1.5KV** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **C569** | **ECWF2394JBB** | **CAP,P .39UF-J-200V** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| C570 | ECA2EM220B | CAP,E 22UF-250V |
| C571 | ECKR2H102KB5 | CAP,C 1000PF-K-500V |
| **C572** | **ECWF2334JBB** | **CAP,P .33UF-J-200V** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| C573 | ECQE2105KFB | CAP,P 1.0UF-K-200V *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| C573 | ECQE2474KFW | CAP,P .47UF-K-200V *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| C580 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C593 | ECEA1HNR47UB | CAP,E .47UF-50V |
| C594 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C595 | ECEA1EN100UB | CAP,E 10UF-25V |
| C601 | ECA1CM471B | CAP,E 470UF-16V |
| C602 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C603 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C604 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C605 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C606 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C607 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C614 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C615 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C616 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C617 | ECQB1H222JM3 | CAP,P 2200PF-J-50V |
| C618 | ECA1HM010B | CAP,E 1UF-50V |
| C619 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C620 | ECQB1H223JM3 | CAP,P .022UF-J-50V |
| C621 | ECA1HMR22B | CAP,E .22UF-50V |
| C623 | ECA1HM010B | CAP,E 1UF-50V |
| C624 | ECJ2VC1H180J | CAP,C 18PF-J-50V |
| C625 | ECA1HM2R2B | CAP,E 2.2UF-50V |
| C626 | ECQB1H273JM3 | CAP,P .27UF-J-50V |
| C627 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C628 | ECJ2VC1H151J | CAP,C 150PF-J-50V |
| C629 | ECA1CM221B | CAP,E 220UF-16V |
| C630 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C631 | ECA1CM221B | CAP,E 220UF-16V |
| C632 | ECJ2VB1H103J | CAP,C .10UF-J-50V |
| C633 | ECA1CM101B | CAP,E 100UF/16V |
| C634 | ECA1HM100B | CAP,E 10UF/50V |
| C640 | ECQB1H104JM3 | CAP,P .1UF-J-50V |
| C641 | ECA1HM100B | CAP,E 10UF/50V |
| C642 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C701 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C741 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C750 | TACCW181T50V | CAP,C 180PF/50V |
| C751 | ECQE1335KFB | CAP,P 3.3UF-K-100V *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| C751 | ECQE1685KFB | CAP,P 6.8UF-K-100V *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| C752 | ECA1VM470B | CAP,E 47UF/35V |
| C753 | ECQB1H222JM3 | CAP,P .22UF-J-50V |
| C754 | TACCW332T50V | CAP,C .0033UF/50V |
| C755 | ECQB1H273JM3 | CAP,P .27UF-J-50V *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| C755 | TACCW472T50V | CAP,C .0047UF/50V *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| C756 | ECKR2H332KB5 | CAP,C 3300PF-K-550V |
| C757 | ECQB1H682JM3 | CAP,P 6800PF-J-50V *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| C763 | ECKR3A121KBP | CAP,C 120PF-K-1KV |
| **C801** | **ECQU2A474MVA** | **CAP,P .47UF-M-250V** |
| **C802** | **ECQU2A473MNB** | **CAP,P .047UF-M-250V** |
| **C804** | **ECQU2A473MNB** | **CAP,P .047UF-M-250V** |
| **C805** | **ECKW2H472PU7** | **CAP,C 4700PF-P-500V** |
| **C806** | **ECKW2H472PU7** | **CAP,C 4700PF-P-500V** |
| **C807** | **ECKW2H472PU7** | **CAP,C 4700PF-P-500V** |
| **C810** | **EC0S2DA561BB** | **CAP,E 560PF-200V** |
| C814 | ECA1VHG101B | CAP,E 100UF-35V |
| C819 | ECKR3D222KBP | CAP,C 2200PF-K-2KVDC |
| C821 | TACCW471T50V | CAP,C 470PF/50V |
| C823 | ECA1CHG101B | CAP,E 100UF-16V |
| **C824** | **ECKCNB222ME** | **CAP,C .0022UF-M-250V** |
| C825 | ECQB1H272JM3 | CAP,P 2700PF-J-50V |
| **C827** | **ECKCNB222ME** | **CAP,C .0022UF-M-250V** |
| C828 | ECA1EM471B | CAP,E 470UF-25V |
| C830 | ECKR2H471KB5 | CAP,C 470PF-K-500W |
| C835 | ECQB1H103JM3 | CAP,P .01UF-J-50V |
| C837 | ECA1CHG332E | CAP,E 3300UF-16V |
| C849 | EC0S2DA221BB | CAP,E 220UF/200V |
| C850 | ECKR3A471KBP | CAP,C 470PF-K-1KV |
| C851 | ECA1CM471B | CAP,E 470UF-16V |
| C860 | ECA1CHG221B | CAP,E 220UF/16V |
| C879 | ECA1HM010B | CAP,E 1UF-50V |
| C881 | ECA1EMH101B | CAP,E 100UF-25V |
| C882 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C883 | ECA1CHG221B | CAP,E 220UF/16V |
| C888 | ECA1CHG471B | CAP,E 470UF-16V |
| C889 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB
## CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C891 | ECA1HHG100B | CAP,E 10UF/50V |
| C904 | ECKR1H103ZF5 | CAP,C .01UF-Z-50V |
| C911 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C912 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C913 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C914 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C915 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C916 | ECA1CM101B | CAP,E 100UF/16V |
| C917 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C921 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C923 | ECJ2VC1H680J | CAP,C 68PF-J-50V |
| C952 | ECA1HM100B | CAP,E 10UF/50V |
| C953 | ECKR1H103ZF5 | CAP,C .01UF-Z-50V |
| C958 | ECA2CM470B | CAP,E 47UF-160V |
| C959 | ECKW2H103ZF7 | CAP,C .01UF-Z-500V |
| C960 | ECCR2H151J5 | CAP,C 150-500V |
| C961 | ECA2AM100B | CAP,E 10UF-100V |
| C962 | ECKW2H103ZF7 | CAP,C .01UF-Z-500V |
| C963 | ECCR1H151J5 | CAP DISC 150-5-50V |
| C964 | ECA1CHG101B | CAP,E 100UF-16V |
| C966 | ECA1CHG101B | CAP,E 100UF-16V |
| C967 | ECA1CM221B | CAP,E 220UF-16V |
| C968 | ECKR1H103ZF5 | CAP,C .01UF-Z-50V |
| C969 | ECKR1H103ZF5 | CAP,C .01UF-Z-50V |
| C971 | TACCW222T50V | CAP,C 2200PF/50V |
| C1051 | TACCX103T50V | CAP,C .01UF/50V |
| C1052 | ECA0JM102B | CAP,E 1000UF-6.3V |
| C1056 | ECA1CM470B | CAP,E 47UF/16V |
| C1057 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C2301 | ECA1HHG100B | CAP,E 10UF/50V |
| C2302 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C2303 | ECA1EHG101B | CAP,E 100UF-25V |
| C2304 | ECA1HM100B | CAP,E 10UF/50V |
| C2305 | ECA1EHG222E | CAP,E 2200UF/25V |
| C2306 | ECA1EHG471B | CAP,E 470UF-25V |
| C2307 | ECJ2VF1H683Z | CAP,C .068UF-Z-50V |
| C2309 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C2310 | ECA1CM101B | CAP,E 100UF/16V |
| C2311 | ECA1HHG100B | CAP,E 10UF/50V |
| C2312 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C2313 | ECA1EHG101B | CAP,E 100UF-25V |
| C2314 | ECA1HM100B | CAP,E 10UF/50V |
| C2315 | ECA1EHG222E | CAP,E 2200UF/25V |
| C2316 | ECA1EHG471B | CAP,E 470UF-25V |
| C2317 | ECJ2VF1H683Z | CAP,C .068UF-Z-50V |
| C2319 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C2320 | ECA1CM470B | CAP,E 47UF/16V |
| C2322 | ECA1VM101B | CAP,E 100UF-35V |
| C2342 | ECJ2VB1H102K | CAP,C .001UF-K-50V |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C2343 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C2347 | ECA1HM470B | CAP,E 47UF-50V |
| C2348 | ECA1HM470B | CAP,E 47UF-50V |
| C2349 | ECA1VHG470B | CAP,E 47UF-35V |
| C2350 | ECA1VHG470B | CAP,E 47UF-35V |
| C2376 | ECA1HM010B | CAP,E 1UF-50V |
| C2377 | ECA1HM010B | CAP,E 1UF-50V |
| C2378 | ECA1HM100B | CAP,E 10UF/50V |
| C2379 | ECA1HM100B | CAP,E 10UF/50V |
| C2380 | ECA1HM010B | CAP,E 1UF-50V |
| C2381 | ECA1HM010B | CAP,E 1UF-50V |
| C2402 | ECJ2VB1H393K | CAP,C .039UF-K-50V |
| C2404 | ECJ2VB1H223K | CAP,C .022UF-K-50V |
| C2405 | ECA1HM010B | CAP,E 1UF-50V |
| C2412 | ECJ2VB1H562K | CAP,C .0056UF-K-50V |
| C2413 | ECA1HM010B | CAP,E 1UF-50V |
| C2420 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C2421 | ECA1CM102B | CAP,E 1000UF/16V |
| C2424 | EEANA1E1R0B | CAP,E 1.0UF-25V |
| C2425 | EEANA1E1R0B | CAP,E 1.0UF-25V |
| C2427 | ECA1HM100B | CAP,E 10UF/50V |
| C2428 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C2429 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C2430 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C2431 | ECA1CM471B | CAP,E 470UF-16V |
| C2432 | ECJ2VB1E104K | CAP,C .10UF-K-25V |
| C2433 | ECQB1H683JM3 | CAP,P .068UF-J-50V |
| C2434 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C2435 | ECA1HM010B | CAP,E 1UF-50V |
| C2436 | ECQB1H683JM3 | CAP,P .068UF-J-50V |
| C2437 | ECJ2VC1H102J | CAP,C .001UF-J-50V |
| C2439 | ECJ2VC1H102J | CAP,C .001UF-J-50V |
| C2441 | ECA1HM010B | CAP,E 1UF-50V |
| C2442 | ECA1HM010B | CAP,E 1UF-50V |
| C2449 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C2801 | ECKR3A471KBP | CAP,C 470PF-K-1KV |
| C2802 | ECA1VHG102B | CAP,E 1000UF-35V |
| C3006 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3007 | ECJ2VF1C105Z | CAP,C 1.0UF-Z-16V |
| C3008 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3013 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3015 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3016 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C3017 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3020 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3021 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3022 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3023 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3024 | ECJ2VB1H102K | CAP,C .001UF-K-50V |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB
## CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C3025 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3026 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3029 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3030 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3031 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3034 | ECA1EM471B | CAP,E 470UF-25V |
| C3036 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C3039 | ECEA1CKA470B | CAP,E 47UF-16V |
| C3041 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3042 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3043 | ECJ2YB1A105K | CAP,C 1.0UF-K-125V |
| C3044 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3046 | ECJ2VB1H102K | CAP,C .001UF-K-50V |
| C3048 | ECJ2VF1C105Z | CAP,C 1.0UF-Z-16V |
| C3049 | ECJ2YB1A105K | CAP,C 1.0UF-K-125V |
| C3050 | ECJ2VF1C105Z | CAP,C 1.0UF-Z-16V |
| C3056 | ECJ2VF1C105Z | CAP,C 1.0UF-Z-16V |
| C3070 | ECJ2YB1A105K | CAP,C 1.0UF-K-125V |
| C3071 | ECJ2YB1A105K | CAP,C 1.0UF-K-125V |
| C3072 | ECJ2YB1A105K | CAP,C 1.0UF-K-125V |
| C3073 | ECA1VM470B | CAP,E 47UF/35V |
| C3083 | ECJ2YB1A105K | CAP,C 1.0UF-K-125V |
| C3084 | ECJ2YB1A105K | CAP,C 1.0UF-K-125V |
| C3094 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3095 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3096 | ECEA1HKA010B | CAP,E 1.0UF-50V |
| C3224 | ECA1VM470B | CAP,E 47UF/35V |
| C3225 | ECA1VM470B | CAP,E 47UF/35V |
| C3226 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C3227 | ECJ2VF1C105Z | CAP,C 1.0UF-Z-16V |
| C6501 | ECA1HM0R1B | CAP,E 0.1UF/50V |
| C6502 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6503 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6504 | ECA1HM0R1B | CAP,E 0.1UF/50V |
| C6505 | ECA1HM100B | CAP,E 10UF/50V |
| C6506 | ECJ2VC1H050C | CAP,C 5PF-C-50V |
| C6510 | ECJ2VC1H390J | CAP,C 39PF-J-50V |
| C6513 | ECJ2VC1H050C | CAP,C 5PF-C-50V |
| C6514 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6515 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6518 | ECJ2VC1H270J | CAP,C 27PF-J-50V |
| C6520 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6522 | ECA0JM331B | CAP,E 330UF-6.3V |
| C6523 | ECA1CM101B | CAP,E 100UF/16V |
| C6524 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6525 | ECJ2VC1H470J | CAP,C 47PF-J-50V |
| C6526 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6527 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6528 | ECJ2VC1H181J | CAP,C 180PF-J-50V |
| C6529 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6530 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6531 | ECA1HM100B | CAP,E 10UF/50V |
| C6532 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6533 | ECJ2VB1H472K | CAP,C .0047UF-K-50V |
| C6534 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6535 | ECEA1HNR47UB | CAP,E .47UF-50V |
| C6536 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6537 | ECA1HM100B | CAP,E 10UF/50V |
| C6538 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6539 | ECJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C6540 | ECJ2VC1H101J | CAP,C 100PF-J-50V |
| C6541 | ECJ2VC1H270J | CAP,C 27PF-J-50V |
| | ***DIODES*** | |
| D001 | MA4039MTA | DIODE, ZENER |
| D002 | MA4039MTA | DIODE, ZENER |
| D005 | MA165TA5VT | DIODE, SWITCHING |
| D014 | MA165TA5VT | DIODE, SWITCHING |
| D015 | MA165TA5VT | DIODE, SWITCHING |
| D022 | MA4300MTA | DIODE |
| D354 | MA165TA5VT | DIODE, SWITCHING |
| D355 | MA165TA5VT | DIODE, SWITCHING |
| D356 | MA165TA5VT | DIODE, SWITCHING |
| D357 | MA4150MTA | DIODE |
| D358 | MA165TA5VT | DIODE, SWITCHING |
| D359 | MA4150MTA | DIODE |
| D360 | ERA22-04V3 | DIODE, SILICONE |
| D361 | ERA22-04V3 | DIODE, SILICONE |
| D362 | ERA22-04V3 | DIODE, SILICONE |
| D375 | MA165TA5VT | DIODE, SWITCHING |
| D451 | ERA15-02V3 | DIODE |
| D452 | MA165TA5VT | DIODE, SWITCHING |
| D455 | MA165TA5VT | DIODE, SWITCHING |
| D456 | MA165TA5VT | DIODE, SWITCHING |
| D457 | MA165TA5VT | DIODE, SWITCHING |
| D459 | MA165TA5VT | DIODE, SWITCHING |
| D490 | D1NL40V70 | DIODE |
| D491 | D1NL40V70 | DIODE |
| **D551** | **ERD07-15E** | **DIODE** |
| **D552** | **RU3NLFA1** | **DIODE** |
| **D553** | **MA4062LTVTA** | **DIODE, ZENER** |
| D554 | MA4270MTA | DIODE |
| D555 | MA165TA5VT | DIODE, SWITCHING |
| D556 | MA4360HTA | DIODE, ZENER |
| D570 | D1NL40V70 | DIODE |
| D580 | D1NL40V70 | DIODE |
| D596 | MA165TA5VT | DIODE, SWITCHING |
| D601 | MA4056HTA | DIODE |
| D740 | MA165TA5VT | DIODE, SWITCHING |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB
## CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| D741 | MA165TA5VT | DIODE, SWITCHING |
| D742 | MA165TA5VT | DIODE, SWITCHING |
| D743 | MA165TA5VT | DIODE, SWITCHING |
| D753 | AU01ZV0 | DIODE |
| **D801** | **D3SB60** | **RECTFIER BRIDGE (INT CKT)** |
| **D803** | **TRPW5B0M050D** | **THERMISTOR** |
| **D814** | **TMPG10G3** | **DIODE** |
| D815 | ERA18-02V3 | DIODE |
| D816 | ERA18-02V3 | DIODE |
| D817 | ERA18-02V3 | DIODE |
| D818 | ERA18-02V3 | DIODE |
| D820 | ERA15-01V3 | DIODE, RECTIFIER |
| D821 | ERA15-01V3 | DIODE, RECTIFIER |
| D822 | ERA15-01V3 | DIODE, RECTIFIER |
| D823 | ERA15-01V3 | DIODE, RECTIFIER |
| D834 | MA165TA5VT | DIODE, SWITCHING |
| D835 | MA165TA5VT | DIODE, SWITCHING |
| D836 | MA4180MTA | DIODE |
| D838 | MA4039MTA | DIODE |
| D839 | MA165TA5VT | DIODE, SWITCHING |
| D841 | RN2ZLFA1 | DIODE |
| D845 | MA165TA5VT | DIODE, SWITCHING |
| **D850** | **RU30ALFS1** | **DIODE, RECTIFIER** |
| D858 | AU02ZV0 | DIODE |
| D1001 | LN21RCPH | DIODE, LED |
| D2302 | MA165TA5VT | DIODE, SWITCHING |
| D2303 | MA165TA5VT | DIODE, SWITCHING |
| D2304 | MA165TA5VT | DIODE, SWITCHING |
| D2306 | MA165TA5VT | DIODE, SWITCHING |
| D2307 | MA165TA5VT | DIODE, SWITCHING |
| D2801 | ERB32-02E | DIODE |
| D3008 | MA4150MTA | DIODE |
| D3009 | MA4150MTA | DIODE |
| D3012 | MA4150MTA | DIODE |
| D3015 | MA4150MTA | DIODE |
| D3016 | MA3110MTX | DIODE, ZENER |
| D3017 | MA3110MTX | DIODE, ZENER |
| D3018 | MA3110MTX | DIODE, ZENER |
| D3019 | MA3110MTX | DIODE, ZENER |
| D3020 | MA3110MTX | DIODE, ZENER |
| D3021 | MA3110MTX | DIODE, ZENER |
| D3022 | MA3110MTX | DIODE, ZENER |
| D3023 | MA3110MTX | DIODE, ZENER |
| D3024 | MA3110MTX | DIODE, ZENER |
| D3025 | MA3110MTX | DIODE, ZENER |
| D3026 | MA3110MTX | DIODE, ZENER |
| D3027 | MA3110MTX | DIODE, ZENER |
| D3028 | MA3110MTX | DIODE, ZENER |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| D3029 | MA3110MTX | DIODE, ZENER |
| D3030 | MA3110MTX | DIODE, ZENER |
| D3031 | MA3110MTX | DIODE, ZENER |
| D3032 | MA3110MTX | DIODE, ZENER |
| D3033 | MA3110MTX | DIODE, ZENER |
| D3044 | MA3110MTX | DIODE, ZENER |
| D3210 | MA3110MTX | DIODE, ZENER |
| D3211 | MA3110MTX | DIODE, ZENER |
| D3213 | MA3110MTX | DIODE, ZENER |
| D3214 | MA3110MTX | DIODE, ZENER |
| D3215 | MA3110MTX | DIODE, ZENER |
| D3216 | MA3110MTX | DIODE, ZENER |
| D3217 | MA3110MTX | DIODE, ZENER |
| D3218 | MA3110MTX | DIODE, ZENER |
| ***FUSES*** | | |
| **F801** | **XBA2A00101** | **FUSE, 125V-6.3A** ***CT-20SX10B CT-20SX10CB CT-24SX10B CT-24SX10CB*** |
| **F801** | **XBA2C63TR0** | **FUSE, 250V-6.3A** ***CT-F2110XBM CT-F2510XBM*** |
| ***INTEGRATED CIRCUITS*** | | |
| IC001 | MN101C46FTC1 | INT CKT |
| IC004 | PQ1R33 | INT CKT |
| IC005 | PQ05RD1B | INT CKT |
| IC006 | PST9128NR | INT CKT |
| **IC101** | **TA1310BN** | **INT CKT** |
| IC302 | TC4066BFN | INT CKT |
| IC351 | TDA6103Q-N3 | INT CKT |
| IC451 | LA78045 | INT CKT |
| IC740 | NJM2904MTE1 | INT CKT |
| IC750 | NJM4565L | INT CKT |
| **IC801** | **STRF6548NF53** | **INT CKT** |
| **IC802** | **SE115NLF4** | **INT CKT** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **IC802** | **SE139NLF4** | **ERROR AMP** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **IC811** | **PC817B** | **INT CKT** |
| IC821 | PQ12RD1B | INT CKT |
| IC882 | AN78M05LB | PLUS 5V AVR |
| IC891 | PQ09RD1B | INT CKT |
| IC2301 | LA4289N | INT CKT |
| IC2302 | LA4289N | INT CKT |
| IC2352 | BA15218N | INT CKT |
| IC2401 | BH3865S | INT CKT |
| IC3001 | CXA2079Q | INT CKT |
| IC6501 | TC90A53N | INT CKT |
| IC6502 | AN78N05LB | INT CKT |
| RM001 | PNA4701M03TV | INT CKT |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| | ***COILS*** | |
| L001 | EXCELSA35V | FERRITE BEAD |
| L005 | ELESN330JA | COIL, PEAKING 33UH |
| L006 | TLUABTA100K | COIL, PEAKING 10UH |
| L007 | TLUABTA100K | COIL, PEAKING 10UH |
| L008 | EXCELDR25V | FERRITE BEAD |
| L009 | EXCELSA35V | FERRITE BEAD |
| L012 | TLUABTA100K | COIL, PEAKING 10UH |
| L013 | TLUABTA100K | COIL, PEAKING 10UH |
| L014 | ELESN330JA | COIL, PEAKING 33UH |
| L301 | ELESN470JA | COIL, PEAKING 47UH |
| L302 | ELESN120JA | COIL, PEAKING 12UH |
| L303 | EXCELDR35V | FERRITE BEAD |
| **L551** | **ELH5L4122** | **COIL** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **L551** | **TLHE040** | **COIL** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| L553 | EXCELSA39V | FERRITE BEAD |
| L556 | ELC18B801E | COIL *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| L559 | TLUADNB682K | COIL |
| L601 | TLUABTA560K | COIL, PEAKING 56UH |
| L706 | EXCELSA35T | FERRITE BEAD |
| L751 | ELC18B501E | COIL *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| L751 | ELC18B801E | COIL *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| L752 | TALL13N103JB | COIL |
| **L801** | **ELF21N024A** | **COIL** |
| **L802** | **ELF21N024A** | **COIL** |
| L805 | EXCELSA35B | FERRITE BEAD |
| L818 | EXCELSA35B | FERRITE BEAD |
| L822 | EXCELSA35B | FERRITE BEAD |
| L850 | EXCELSA39E | FERRITE BEAD |
| L851 | EXCELSA39E | FERRITE BEAD |
| L852 | TALL08T101KA | LINE FILTER |
| L951 | EXCELSA24T | FERRITE BEAD |
| L953 | EXCELSA24T | FERRITE BEAD |
| L954 | EXCELSA24T | FERRITE BEAD |
| L955 | EXCELSA24T | FERRITE BEAD |
| L2401 | ELESN101JA | COIL, PEAKING 100UH |
| L2801 | EXCELDR35V | FERRITE BEAD |
| L2804 | EXCELDR35V | FERRITE BEAD |
| L6501 | ELESN270JA | COIL, 27UH |
| L6504 | ELESN101JA | COIL, PEAKING 100UH |
| L6505 | ELESN330JA | COIL, PEAKING 33UH |
| L6507 | ELESN101JA | COIL, PEAKING 100UH |
| L6512 | ELESN101JA | COIL, PEAKING 100UH |
| L6513 | ELESN101JA | COIL, PEAKING 100UH |
| L6514 | ELESN330JA | COIL, PEAKING 33UH |
| L6520 | ELESN150JA | COIL, PEAKING 15UH |
| | ***TRANSISTORS*** | |
| Q007 | 2SD601ATX | TRANSISTOR |
| Q008 | 2SD601ARTX | TRANSISTOR |
| Q009 | 2SD601ARTX | TRANSISTOR |
| Q301 | 2SD601ATX | TRANSISTOR |
| Q302 | 2SD601ATX | TRANSISTOR |
| Q303 | 2SD601ARTX | TRANSISTOR |
| Q357 | 2SC3311ATA | TRANSISTOR |
| Q369 | 2SA1309ATA | TRANSISTOR |
| Q401 | 2SD601ATX | TRANSISTOR |
| Q451 | 2SC3311ATA | TRANSISTOR |
| Q480 | 2SA1309ATA | TRANSISTOR |
| Q501 | 2SC3941HTA | TRANSISTOR |
| Q536 | 2SD601ATX | TRANSISTOR |
| Q551 | 2SD2553LB306 | TRANSISTOR |
| Q601 | 2SB709ATX | TRANSISTOR |
| Q602 | 2SC3941HTA | TRANSISTOR |
| Q603 | 2SD601ATX | TRANSISTOR |
| Q701 | 2SD601ATX | TRANSISTOR |
| Q751 | 2SK2146LB | TRANSISTOR |
| Q754 | 2SC3311ATA | TRANSISTOR |
| Q755 | 2SA1309ATA | TRANSISTOR |
| Q817 | 2SD601ATX | TRANSISTOR |
| Q854 | 2SA19610QAHW | TRANSISTOR |
| Q901 | 2SB709ATX | TRANSISTOR |
| Q902 | 2SB709ATX | TRANSISTOR |
| Q903 | 2SD601ATX | TRANSISTOR |
| Q904 | 2SB709ATX | TRANSISTOR |
| Q905 | 2SB709ATX | TRANSISTOR |
| Q906 | 2SD601ATX | TRANSISTOR |
| Q907 | 2SB709ATX | TRANSISTOR |
| Q908 | 2SD601ATX | TRANSISTOR |
| Q951 | 2SC3311ATA | TRANSISTOR |
| Q952 | 2SC3311ATA | TRANSISTOR |
| Q953 | 2SC1741ASTP | TRANSISTOR |
| Q954 | 2SB1030ATA | TRANSISTOR |
| Q955 | 2SB1569AF51 | TRANSISTOR |
| Q956 | 2SD2400AF51 | TRANSISTOR |
| Q957 | 2SA1309ATA | TRANSISTOR |
| Q958 | 2SC3311ATA | TRANSISTOR |
| Q961 | 2SC3311ATA | TRANSISTOR |
| Q962 | 2SC3311ATA | TRANSISTOR |
| Q2301 | 2SD601ARTX | TRANSISTOR |
| Q2303 | 2SB709ARTX | TRANSISTOR |
| Q2304 | 2SD601ARTX | TRANSISTOR |
| Q2313 | 2SD601ARTX | TRANSISTOR |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| Q2351 | 2SD601ARTX | TRANSISTOR |
| Q2352 | 2SD601ARTX | TRANSISTOR |
| Q2353 | 2SB709ARTX | TRANSISTOR |
| Q3010 | 2SD601ATX | TRANSISTOR |
| Q3011 | 2SD601TX | TRANSISTOR |
| Q3012 | 2SD601ATX | TRANSISTOR |
| Q3101 | 2SD601ATX | TRANSISTOR |
| Q6504 | 2SD601ATX | TRANSISTOR |
| Q6507 | 2SD601ATX | TRANSISTOR |
| Q6508 | 2SB709ATX | TRANSISTOR |
| Q6510 | 2SB709ATX | TRANSISTOR |
| Q6518 | 2SD601ATX | TRANSISTOR |
| Q6519 | 2SD601ATX | TRANSISTOR |
| Q6520 | 2SB709ATX | TRANSISTOR |
| | ***RELAYS*** | |
| **RL801** | **TSEH8007** | **RELAY** |
| | ***RESISTORS*** | |
| R005 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R007 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R008 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R009 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R010 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R013 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R014 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R015 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R016 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R017 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R018 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R019 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R020 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R022 | ERDS2TJ332T | RES,C 3.3K-J-1/4W |
| R023 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R024 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R026 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R027 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R028 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R029 | ERJ6ENF1302V | RES,M 13K-F-1/10W |
| R031 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R032 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R034 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R035 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R036 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R037 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R040 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R044 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R045 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R046 | ERJ6GEYJ182V | RES,M 1.8K-J-1/10W |
| R048 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R049 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R051 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R052 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R053 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R054 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R055 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R056 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R060 | ERJ6GEYJ333V | RES,M 33K-J-1/10W |
| R061 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W |
| R062 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R063 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R064 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R066 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R069 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R070 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R075 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R077 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R099 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R301 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R303 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R305 | ERDS2TJ331T | RES,C 330-J-1/4W |
| R306 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R308 | ERJ6GEYJ273V | RES,M 27K-J-1/10W |
| R309 | ERJ6GEYJ333V | RES,M 33K-J-1/10W |
| R310 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R351 | ER0S2TKF9100 | RES,M 910-F-1/4W |
| R352 | ER0S2TKF9100 | RES,M 910-F-1/4W |
| R353 | ER0S2TKF9100 | RES,M 910-F-1/4W |
| R354 | ERDS2TJ621T | RES,C 620-J-1/4W |
| R355 | ERDS2TJ621T | RES,C 620-J-1/4W |
| R356 | ERDS2TJ621T | RES,C 620-J-1/4W |
| R357 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R358 | ERDS1TJ124T | RES,C 120K-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R358 | ERG1SJ104P | RES,M 100K-J-1W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R359 | ERDS1TJ124T | RES,C 120K-J-1/2W. *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R359 | ERG1SJ104P | RES,M 100K-J-1W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R360 | ERDS1TJ124T | RES,C 120K-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R360 | ERG1SJ104P | RES,M 100K-J-1W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R361 | ER0S2TKF7681 | RES,M 7.68K-F-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R361 | ER0S2TKF8451 | RES,M 7.68K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R362 | ER0S2TKF1541 | RES,M 1.54K-F-1/4W |
| R363 | ERC12GK102V | RES,C 10K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R363 | ERC12GK152V | RES,C 1.5K-K-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R364 | ERC12GK102V | RES,C 10K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R364 | ERC12GK152V | RES,C 1.5K-K-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R365 | ERC12GK102V | RES,C 10K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R365 | ERC12GK152V | RES,C 1.5K-K-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R367 | ERDS1TJ104T | RES,C 100K-J-1/2W |
| R368 | ER0S2TKF1202 | RES,M 12K-F-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R368 | ER0S2TKF1402 | RES,M 14K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R369 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R371 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R372 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R374 | ERQ12AJ121P | RES,F 120-J-1/2W |
| R383 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R384 | ERDS2TJ104T | RES,C 100K-J-1/4W |
| R385 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R401 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R402 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R403 | ERDS2TJ104T | RES,C 100K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R403 | ERDS2TJ125T | RES,C 1.2M-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R405 | ERDS2TJ304T | RES,C 300K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R407 | ERDS2TJ304T | RES,C 300K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R408 | ERJ6ENF2492V | RES,M 24.9K-F-1/10W |
| R409 | ERJ6ENF1003V | RES,M 100K-F-1/10W |
| R450 | ERDS2TJ821T | RES,C 820-J-1/4W |
| R451 | ERG2FJ331H | RES,M 330-J-2W |
| R452 | ERDS1FJ6R8T | RES,C 6.8-J-1/2W |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R453 | ER0S2TKF1202 | RES,M 12K-F-1/4W |
| R454 | ERDS2TJ102T | RES,C 1K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R454 | ERDS2TJ182T | RES,C 1.8K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R455 | ERDS2TJ182T | RES,C 1.8K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R455 | ERDS2TJ222T | RES,C 2.2K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R456 | ERDS2TJ181T | RES,C 180-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R456 | ERDS2TJ821T | RES,C 820-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R457 | ERDS2TJ361T | RES,C 360-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R457 | ERDS2TJ681T | RES,C 680-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R459 | ERX1SJ1R2P | RES,M 1.2-J-1W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R459 | ERX1SJ1R5P | RES,M 1.5-J-1W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R460 | ER0S2TKF1402 | RES,M 14K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R460 | ER0S2TKF1432 | RES,M 14.3-F-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R461 | ER0S2TKF1911 | RES,M 1.91K-F-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R461 | ER0S2TKF2001 | RES,M 2K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R468 | ERDS2TJ104T | RES,C 100K-J-1/4W |
| R469 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R470 | ERDS2TJ562T | RES,C 5.6K-J-1/4W |
| R471 | ERDS2TJ224T | RES,C 220K-J-1/4W |
| R472 | ERDS2TJ123T | RES,C 12K-J-1/4W |
| **R473** | **ERDS1FJ1R0T** | **RES,C 1.0-J-1/2W** |
| **R475** | **ERDS1FJ1R0T** | **RES,C 1.0-J-1/2W** |
| R476 | ERDS2TJ272T | RES,C 2.7K-J-1/4W |
| R480 | ERDS2TJ392T | RES,C 3.9K-J-1/4W |
| R481 | ERDS1FJ1R0T | RES,C 1.0-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R481 | ERDS1FJ1R8T | RES,C 1.8-J-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R482 | ERDS1FJ1R0T | RES,C 1.0-J-1/2W |
| R485 | ERDS2TJ152T | RES,C 1.5K-J-1/4W |
| R486 | ERDS2TJ473T | RES,C 47K-J-1/4W |
| R487 | ERDS2TJ822T | RES,C 8.2K-J-1/4W |
| R489 | ER0S2TKF1202 | RES,M 12K-F-1/4W |
| R490 | ER0S2TKF5101 | RES,M 5.1K-F-1/4W |
| R491 | ER0S2TKF1052 | RES,M 10.5K-F-1/4W |
| R510 | ERG2FJ332H | RES,M 3.30K-J-2W |
| R512 | ERG3FJ222H | RES,M 2200-J-3W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R512 | ERG3FJ272H | RES,M 2.7K-J-3W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R513 | ERDS2TJ561T | RES,C 560-J-1/4W |
| R514 | ERDS2TJ161T | RES,C 160-J-1/4W |
| R524 | ERG1FJS122D | RES,M 1200-J-1W |
| R538 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R542 | ERJ6GEYJ272V | RES,M 2.7K-J-1/10W |
| R546 | ERJ6GEYJ561V | RES,M 560-J-1/10W |
| R550 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W |
| R554 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R555 | ERDS1TJ561T | RES,C 560-J-1/2W |
| **R556** | **ERQ1CJP1R8S** | **RES,F 1.8-J-1W *CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **R556** | **ERQ1CKPR56S** | **RES,F .56-K-1W *CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| R557 | ERF10ZK2R7 | RES,W 2.7-K-10W |
| R561 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R562 | ERDS2TJ332T | RES,C 3.3K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R562 | ERDS2TJ392T | RES,C 3.9K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R576 | ERQ12AJ101 | RES,F 100-J-1/2 *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R576 | ERQ12AJ560 | RES, F 56-J-1/2 *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| **R580** | **ERD25FJ4R7P** | **RES,C 4.7-J-1/4W** |
| **R581** | **ER0S2TKF5601** | **RES,M 5.6K-F-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **R581** | **ER0S2TKF5761** | **RES,M 5.76-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **R582** | **ERJ6ENF1692V** | **RES,M 16.9K-F-1/10W** |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R590 | ERDS2TJ563T | RES,C 56K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R590 | ERDS2TJ683T | RES,C 68K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R594 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| R597 | ER0S2TKF2202 | RES,M 22K-F-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R597 | ER0S2TKF3302 | RES,M 33K-F-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R599 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R601 | ERDS2TJ152T | RES,C 1.5K-J-1/4W |
| R602 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R603 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R604 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R606 | ERJ6GEYJ222V | RES,M 2.2K-J-1/10W |
| R607 | ERJ6GEYJ391V | RES,M 390-J-1/10W |
| R608 | ERJ6GEYJ333V | RES,M 33K-J-1/10W |
| R609 | ERJ6GEYJ474V | RES,M 470K-J-1/10W |
| R610 | ERDS2TJ622T | RES,C 2.7K-J-1/4W |
| R613 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R614 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R615 | ERQ14AJ4R7P | RES,F 4.7-J-1/4W |
| R616 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R618 | ERJ6GEYJ474V | RES,M 470K-J-1/10W |
| R619 | ERJ6GEYJ563V | RES,M 56K-J-1/10W |
| R620 | ERJ6GEYJ153V | RES,M 15K-J-1/10W |
| R622 | ERJ6GEYJ155V | RES,M 1.5MEG-J-1/10W |
| R701 | ERDS2TJ102T | RES,C 1K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R701 | ERDS2TJ153T | RES,C 15K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R702 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R703 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R704 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R705 | ERDS2TJ332T | RES,C 3.3K-J-1/4W |
| R706 | ERDS2TJ225T | RES,C 2.2M-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R707 | ERDS2TJ225T | RES,C 2.2M-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R708 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R709 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R710 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R711 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R712 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R713 | ERDS2TJ822T | RES,C 8.2K-J-1/4W |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R714 | ERDS1FJ102T | RES,C 1K-J-1/2W |
| R716 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R717 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R718 | ERDS2TJ223T | RES,C 22K-J-1/4W |
| R740 | ERJ6ENF4022V | RES,M 40.2K-F-1/10W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R740 | ERJ6ENF6652V | RES,M 66.5K-F-1/10W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R741 | ERJ6ENF1272V | RES,M 12.7K-F-1/10W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R741 | ERJ6ENF8661V | RES,M 8.66K-F-1/10W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R742 | ERJ6ENF1432V | RES,M 14.3K-F-1/10W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R742 | ERJ6ENF6201V | RES,M 6.2K-F-1/10W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R743 | ERJ6ENF5602V | RES,M 56K-F-1/10W |
| R744 | ERJ6ENF5602V | RES,M 56K-F-1/10W |
| R745 | ERJ6ENF2002V | RES,M 20K-F-1/10W |
| R746 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R747 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R752 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R753 | ERDS1FJ102T | RES,C 1K-J-1/2W |
| R754 | ERDS1TJ202T | RES,C 2K-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R754 | ERDS1TJ822T | RES,C 8.2K-J-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R756 | ERG2FJ820H | RES,M 82-J-2W |
| R757 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R758 | ERDS2TJ331T | RES,C 330-J-1/4W |
| **R801** | **ERF15ZK1R2** | **RES,W 1.2-J-15W** |
| R805 | ERDS2TJ102T | RES,C 1K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R805 | ERDS2TJ132T | RES,C 1.3K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R811 | ERG2FJ473H | RES,M 47K-J-2W |
| R812 | ERG2FJ820H | RES,M 82-J-2W |
| R813 | ERDS2TJ132T | RES,C 1.3K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R813 | ERDS2TJ152T | RES,C 1.5K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R815 | ERDS1FJ681T | RES,C 680-J-1/2 |
| R816 | ERX12SJR27P | RES,M .27-J-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R816 | ERX12SJR33P | RES,M .33-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R817 | ERX12SJR27P | RES,M .27-J-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R817 | ERX12SJR33P | RES,M .33-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R819 | ERX12SJR47P | RES,M .47-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R821 | ERDS1FJ1R5T | RES,C 1.5-J-1/2W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R821 | ERDS1FJ1R8T | RES,C 1.8-J-1/2W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R822 | ERDS1FJ102T | RES,C 1K-J-1/2W |
| R823 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R826 | ERDS2TJ332T | RES,C 3.3K-J-1/4W |
| R829 | ERDS1FJ1R5T | RES,C 1.5-J-1/2W |
| R830 | ERDS2TJ180T | RES,C 18-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R830 | ERDS2TJ330T | RES,C 33-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| **R832** | **ERC12ZGM825D** | **RES,S 8.2MEG-M-1/2** |
| R834 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R835 | ERQ14AJ101P | RES,F 100-J-1/4W |
| R836 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R837 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R843 | ERDS2TJ102T | RES,C 1K-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R843 | ERDS2TJ122T | RES,C 1.2K-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R845 | ERDS2TJ470T | RES,C 47-J-1/4W |
| R852 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R854 | ERDS2TJ913T | RES,C 91K-J-1/4W |
| R855 | ERQ14AJW271E | RES,F 270-K-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R856 | ERG1SJ273P | RES,M 27K-J-1W |
| R857 | ERDS2TJ223T | RES,C 22K-J-1/4W |
| R858 | ERDS2TJ272T | RES,C 2.7K-J-1/4W |
| R859 | ERDS2TJ123T | RES,C 12K-J-1/4W |
| R868 | ERDS2TJ821T | RES,C 820-J-1/4W |
| R891 | ERG3FJS220H | RES,M 22-J-3W |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB
## CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R901 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R902 | ERJ6GEYJ561V | RES,M 560-J-1/10W |
| R903 | ERJ6GEYJ681V | RES,M 680-J-1/10W |
| R904 | ERJ6GEYJ151V | RES,M 150-J-1/10W |
| R905 | ERJ6GEYJ183V | RES,M 18K-J-1/10W |
| R906 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R909 | ERJ6GEYJ561V | RES,M 560-J-1/10W |
| R910 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R911 | ERJ6GEYJ822V | RES,M 8.2K-J-1/10W |
| R912 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| R913 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| R914 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| R915 | ERJ6GEYJ822V | RES,M 8.2K-J-1/10W |
| R917 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R918 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R919 | ERJ6GEYJ561V | RES,M 560-J-1/10W |
| R922 | ERDS2TJ331T | RES,C 330-J-1/4W |
| R923 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R924 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R925 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R926 | ERJ6GEYJ751V | RES,M 750-J-1/10W |
| R927 | ERJ6GEYJ162V | RES,M 1.6K-J-1/10W |
| R930 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R931 | ERJ6GEYJ272V | RES,M 2.7K-J-1/10W |
| R932 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R933 | ERJ6GEYJ751V | RES,M 750-J-1/10W |
| R951 | ERDS2TJ821T | RES,C 820-J-1/4W |
| R952 | ERDS2TJ223T | RES,C 22K-J-1/4W |
| R953 | ERDS2TJ332T | RES,C 3.3K-J-1/4W |
| R954 | ERDS2TJ431T | RES,C 430-J-1/4W |
| R956 | ERDS2TJ121T | RES,C 120-J-1/4W *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| R956 | ERDS2TJ750T | RES,C 75-J-1/4W *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| R958 | ERDS2TJ391T | RES,C 390-J-1/4W |
| R959 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R960 | ERQ14AJ100E | RES,F 10-J-1/4W |
| R961 | ERQ1CJP331S | RES,F 330-J-1W |
| R962 | ERDS2TJ330T | RES,C 33-J-1/4W |
| R963 | ERDS2TJ330T | RES,C 33-J-1/4W |
| R964 | ERDS2TJ471T | RES,C 470-J-1/4W |
| R965 | ERDS2TJ563T | RES,C 56K-J-1/4W |
| R966 | ERDS1FVJ471T | RES,C 470-J-1/4W |
| R967 | ERDS2TJ563T | RES,C 56K-J-1/4W |
| R968 | ERDS2TJ471T | RES,C 470-J-1/4W |
| R969 | ERDS2TJ390T | RES,C 39-J-1/2W |
| R970 | ERDS2TJ2R7T | RES,C 2.7-J-1/4W |
| R971 | ERDS2TJ2R7T | RES,C 2.7-J-1/4W |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R972 | ERDS2TJ390T | RES,C 39-J-1/2W |
| R973 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R974 | ERDS2TJ333T | RES,C 33K-J-1/4W |
| R975 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R976 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R977 | ERDS2TJ561T | RES,C 560-J-1/4W |
| R978 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R987 | ERDS2TJ472T | RES,C 4.7K-J-1/4 |
| R988 | ERDS2TJ331T | RES,C 330-J-1/4W |
| R989 | ERDS2TJ682T | RES,C 6.8K-J-1/4W |
| R990 | ERDS2TJ471T | RES,C 470-J-1/4W |
| R993 | ERDS2TJ471T | RES,C 470-J-1/4W |
| R1051 | ER0S2TKF1002 | RES,M 10K-F-1/4 |
| R1052 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R1053 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R1054 | ERDS2TJ332T | RES,C 3.3K-J-1/4W |
| R1055 | ERDS2TJ512T | RES,C 5.1K-J-1/4W |
| R1056 | ERDS2TJ912T | RES,C 9.1K-J-1/4W |
| R1057 | ERDS2TJ223T | RES,C 22K-J-1/4W |
| R1058 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R1059 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R1060 | ERDS2TJ470T | RES,C 47-J-1/4W |
| R1061 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R1062 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R2301 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R2302 | ERJ6GEYJ4R7V | RES,M 4.7-J-1/10W |
| R2303 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2305 | ERJ6GEYJ681V | RES,M 680-J-1/10W |
| R2307 | ER0S2TKF1372 | RES,M 13.7K-F-1/4W |
| R2308 | ER0S2TKF5361 | RES,M 5.36K-F-1/4W |
| R2309 | ER0S2TKF1502 | RES,M 15.0K-F-1/4 |
| R2310 | ERJ6GEYJ183V | RES,M 18K-J-1/10W |
| R2311 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R2312 | ERJ6GEYJ4R7V | RES,M 4.7-J-1/10W |
| R2313 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R2314 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2315 | ERJ6GEYJ681V | RES,M 680-J-1/10W |
| R2321 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R2322 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R2323 | ERJ6GEYJ271V | RES,M 270-J-1/10W |
| R2324 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R2325 | ERJ6GEYJ223V | RES,M 22K-J-1/10W |
| R2326 | ER0S2TKF1502 | RES,M 15.0K-F-1/4 |
| R2330 | ERX1SJ1R0P | RES,M 1.0-J-1W |
| R2331 | ERX1SJ1R0P | RES,M 1.0-J-1W |
| R2339 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R2340 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R2353 | ERJ6GEYJ183V | RES,M 18K-J-1/10W |
| R2354 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB
## CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R2355 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2356 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R2357 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2358 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R2359 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R2359 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R2360 | ERDS2TJ222T | RES,C 2.2K-J-1/4W |
| R2362 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R2365 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R2366 | ERJ6GEYJ183V | RES,M 18K-J-1/10W |
| R2367 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2368 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R2369 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2370 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R2371 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R2372 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R2373 | ERDS1TJ561T | RES,C 560-J-1/2W |
| R2373 | ERJ6GEYJ223V | RES,M 22K-J-1/10W |
| R2374 | ERDS1TJ561T | RES,C 560-J-1/2W |
| R2375 | ERDS1TJ820T | RES,C 82-J-1/2W |
| R2380 | ERDS1TJ820T | RES,C 82-J-1/2W |
| R2403 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R2404 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2407 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2427 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R2429 | ERJ6GEYJ123V | RES,M 12K-J-1/10W |
| R2430 | ER0S2TKF2202 | RES,M 22K-F-1/4W |
| R2433 | ERJ6GEYJ123V | RES,M 12K-J-1/10W |
| R2434 | ERJ6ENF1602V | RES,M 16K-F-1/4W |
| R2439 | ERJ6GEYJ224V | RES,M 220K-J-1/10W |
| R2440 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2441 | ERJ6GEYJ470V | RES,M 47-J-1/10W |
| R2443 | ERJ6GEYJ470V | RES,M 47-J-1/10W |
| R2451 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| R3001 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R3003 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R3004 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R3005 | ERJ6GEYJ153V | RES,M 15K-J-1/10W |
| R3006 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3007 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R3008 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R3009 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3010 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3013 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3018 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3019 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R3020 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R3021 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3022 | ERJ6GEYJ750V | RES,M 75-J-1/10W |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R3023 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3024 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3025 | ERJ6GEYJ392V | RES,M 3.9K-J-1/10W |
| R3028 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3029 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3031 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R3032 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3037 | ERJ6GEYJ560V | RES,M 56-J-1/10W |
| R3038 | ERJ6GEYJ560V | RES,M 56-J-1/10W |
| R3040 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3042 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3043 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3047 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3048 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3053 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3062 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3066 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3067 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R3068 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3071 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3073 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R3074 | ERJ6GEYJ153V | RES,M 15K-J-1/10W |
| R3075 | ERJ6GEYJ392V | RES,M 3.9K-J-1/10W |
| R3080 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3081 | ERJ6GEYJ153V | RES,M 15K-J-1/10W |
| R3082 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R3083 | ERJ6GEYJ392V | RES,M 3.9K-J-1/10W |
| R3086 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3090 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R3091 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R3092 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R3098 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R3104 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3106 | ERJ6GEYJ184V | RES,M 180K-J-1/10W |
| R3109 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R3112 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R3179 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3180 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3181 | ERJ6GEYJ750V | RES,M 75-J-1/10W |
| R3182 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6502 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R6503 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6504 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| R6505 | ERJ6GEYJ512V | RES,M 5.1K-J-1/10W |
| R6506 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R6507 | ERJ6GEYJ514V | RES,M 510K-J-1/10W |
| R6509 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6510 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R6511 | ERJ6GEYJ471V | RES,M 470-J-1/10W |

# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R6517 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R6518 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6519 | ERJ6GEYJ822V | RES,M 8.2K-J-1/10W |
| R6521 | ERJ6ENF3240V | RES,M 324-F-1/10W |
| R6522 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R6523 | ERJ6ENF3320V | RES,M 332-F-1/10W |
| R6524 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6530 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6531 | ERJ6ENF1131V | RES,M 1.13K-F-1/10W |
| R6532 | ERJ6GEYJ821V | RES,M 820-J-1/10W |
| R6533 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R6535 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6545 | ERJ6GEYJ822V | RES,M 8.2K-J-1/10W |
| R6547 | ERJ6GEYJ911V | RES,M 910-J-1/10W |
| R6548 | ERJ6GEYJ821V | RES,M 820-J-1/10W |
| R6549 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6550 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6552 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6555 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6559 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6561 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6562 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6563 | ERJ6ENF1131V | RES,M 1.13K-F-1/10W |
| R6564 | ERJ6ENF1780V | RES,M 178-F-1/10 |
| R6565 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R6566 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R6567 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R6569 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R6570 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R6571 | ERJ6GEYJ123V | RES,M 12K-J-1/10W |
| R6572 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R6575 | ERJ6GEYJ821V | RES,M 820-J-1/10W |
| R6576 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| | ***SWITCHES*** | |
| S001 | TSE2AD002 | SWITCH, PUSH |
| S002 | EVQPBD05R | SWITCH |
| S003 | EVQPBD05R | SWITCH |
| S004 | EVQPBD05R | SWITCH |
| S005 | EVQPBD05R | SWITCH |
| S006 | EVQPBD05R | SWITCH |
| S007 | EVQPBD05R | SWITCH |
| | ***TRANSFORMERS*** | |
| **T001** | **TLP16297** | **TRANSFORMER, POWER SUPPLY** |
| T501 | ETH19Y70AY | TRANSFORMER, HORIZONTAL DRIVER |
| **T551** | **ZTFN05001A** | **TRANSFORMER, FLY BACK** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| **T551** | **ZTFN05003A** | **TRANSFORMER, FLY BACK** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **T801** | **ETS39AG2M5NC** | **TRANSFORMER, SWITCHING** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **T801** | **ETS39AG2T5NC** | **TRANSFORMER, SWITCHING** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| | ***CRYSTALS/FILTERS*** | |
| X301 | TSS2AA001 | CRYSTAL, 3.58MHZ |
| X302 | TAFCSB503F30 | CRYSTAL |
| X1101 | TSSA092 | CRYSTAL OSCILLATOR |
| | ***OTHERS*** | |
| TNR001 | ENGE6101D | TUNER |
| **M001** | **A51LSK955X-A** | **CRT 20"** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| **M002** | **A60LUQ085X** | **CRT 25"** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| DY | KDY3NWA35F | YOKE, DEFLECTION *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| DY | KDY4QHA31F | YOKE, DEFLECTION *CT-24SX10B CT-24SX10CB CT-F2510XB CT-24SX10B* |
| **M003** | **TJSC01200** | **CRT SOCKET** |
| **DEG** | **TSP2AA014** | **COIL, DEGAUSSING 25"** ***CT-24SX10B CT-24SX10CB CT-F2510XB*** |
| **DEG** | **TSP2AA018** | **COIL, DEGAUSSING 20"** ***CT-20SX10B CT-20SX10CB CT-F2110XB*** |
| M004 | TXF3A011DB2 | ASSY. DAG GROUND *CT-20SX10BM CT-20SX10CBM CT-F2110XBM* |
| M005 | TXF3A0190DA | ASSY., DAG GND *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| M006 | 0FMK014ZZ | CONVERGENCE CORRECTOR STRIP |
| M007 | ETC35C65NA | CONVERGENCE YOKE *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| M008 | EUR511502 | REMOTE CONTROL |
| M009 | UR51EC975 | BATTERY COVER, REMOTE |
| M010 | TXANV13BSER | SPEAKER KIT |
| M011 | TBM2A30843 | PANASONIC BADGE *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| M012 | TBM4G3008 | PANASONIC BADGE *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| M013 | TBX4G85700 | POWER BUTTON |
| M014 | TEK6940 | DOOR CATCH |
| M015 | TKK4G8533 | LED PANEL |

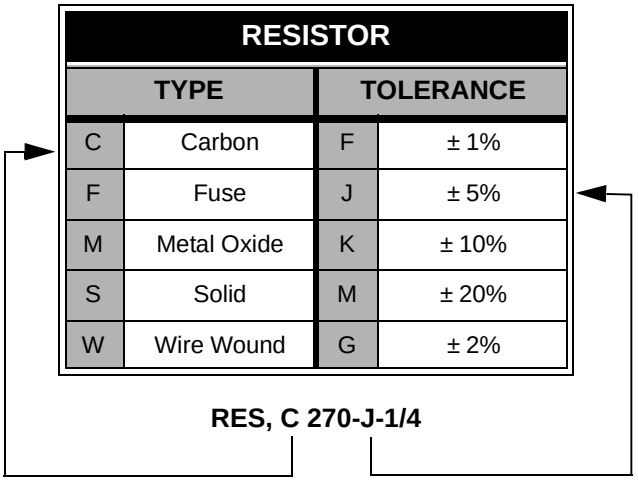
# REPLACEMENT PARTS LIST

## Models: CT-20SX10B, CT-20SX10CB, CT-24SX10B, CT-24SX10CB CT-F2110XB & CT-F2510XB

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

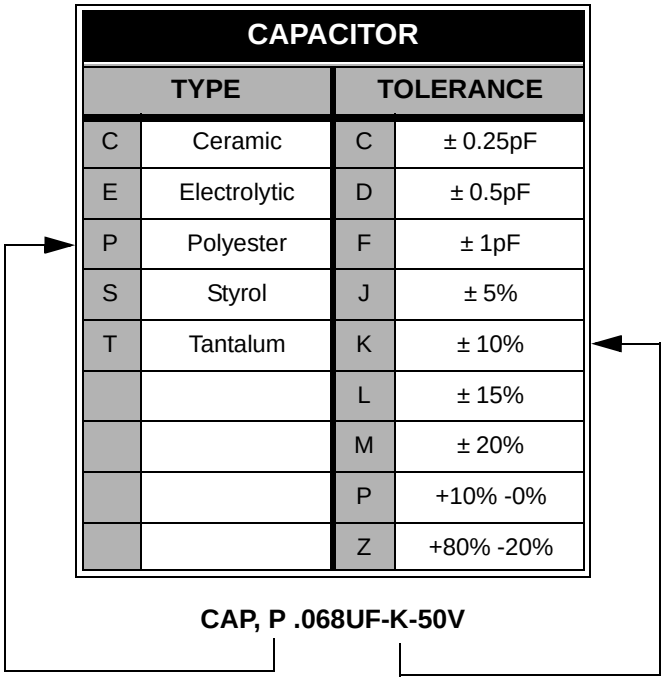
| | | |
|---|---|---|
| M016 | TKP4G11950 | REAR A/V BRACKET |
| M017 | TQB2AA0363 | MANUAL, OWNERS *CT-20SX10B CT-24SX10B CT-F2510XB CT-F2110XB* |
| M018 | TQB2AA0364 | MANUAL, OWNERS *CT-20SX10CB CT-24SX10CB* |
| M019 | TQB2AA7058 | REMOTE GUIDE |
| M020 | TQB2AA7076 | V-CHIP ROLLER GUIDE |
| M021 | TXFKY35BSER | ASSY, CABINET FRONT *CT-24SX10B CT-24SX10CB* |
| M022 | TXFKU57BSER | ASSY, CABINET BACK *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| M023 | TXFKY31BSER | ASSY, CABINET FRONT *CT-20SX10B CT-20SX10CB* |
| M024 | TXFKU54BSER | ASSY, CABINET BACK *CT-20SX10B CT-20SX10CB CT-F21110XB* |
| M025 | TXFKY32BSER | ASSY, CABINET FRONT *CT-F2110XB* |
| M026 | TXFKY36BSER | ASSY, CABINET FRONT *CT-F2510XB* |
| M027 | TKP4G11470S | ASSY, CONTROL DOOR *CT-20SX10B CT-20SX10CB CT-F2110XB* |
| M028 | TKP4G11490S | ASSY, CONTROL DOOR *CT-24SX10B CT-24SX10CB CT-F2510XB* |
| **M029** | **TXASX2710FHS** | **ASSY., LINE CORD** |
| M030 | TXANV14BSER | EXT. CABLE KIT( 25 pins) |
| M031 | TXANV15BSER | EXT. CABLE KIT( 8 & 6 pins) |
| JK3001 | TJB2AA0271 | TERMINAL, REAR A/V |
| JK3151 | TJBA125 | TERMINAL, FRONT A/V, S-VHS |

## DESCRIPTION OF ABBREVIATIONS GUIDE



| RESISTOR | | | |
|---|---|---|---|
| TYPE | | TOLERANCE | |
| C | Carbon | F | ± 1% |
| F | Fuse | J | ± 5% |
| M | Metal Oxide | K | ± 10% |
| S | Solid | M | ± 20% |
| W | Wire Wound | G | ± 2% |

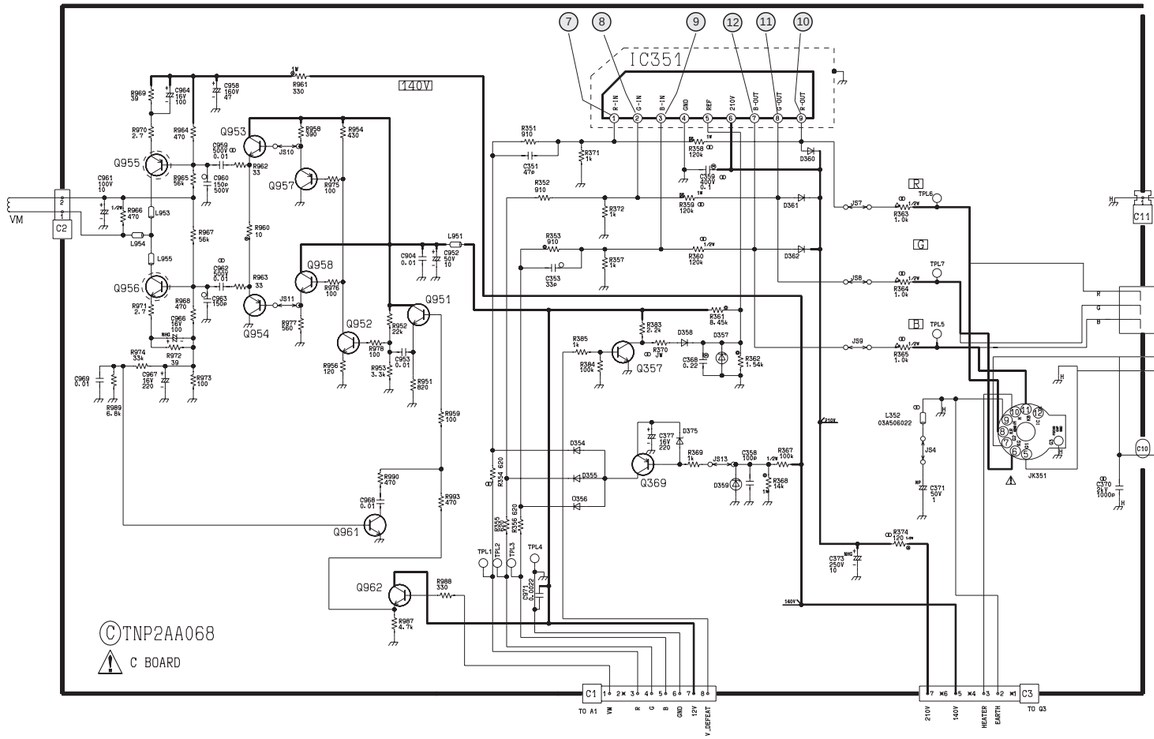
**RES, C 270-J-1/4**

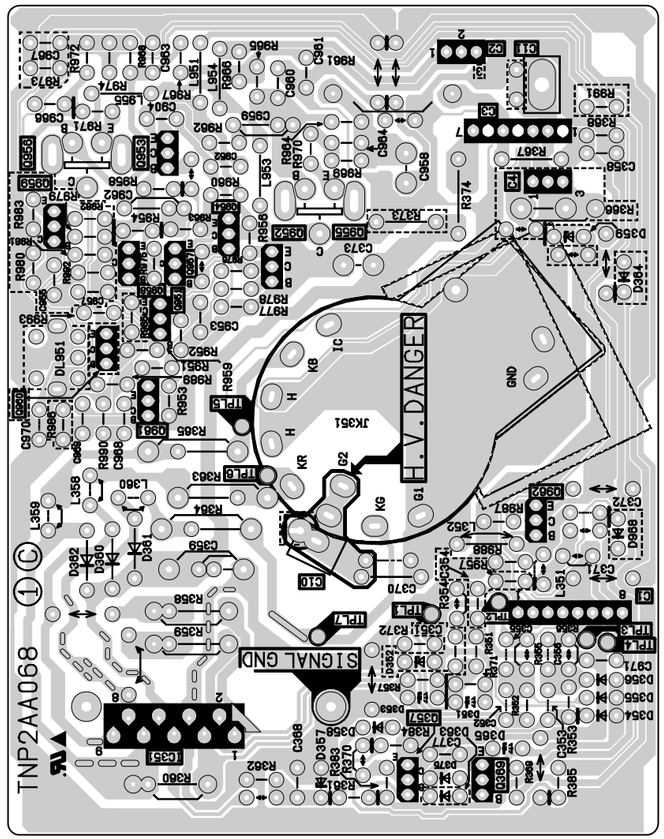


| CAPACITOR | | | |
|---|---|---|---|
| TYPE | | TOLERANCE | |
| C | Ceramic | C | ± 0.25pF |
| E | Electrolytic | D | ± 0.5pF |
| P | Polyester | F | ± 1pF |
| S | Styrol | J | ± 5% |
| T | Tantalum | K | ± 10% |
| | | L | ± 15% |
| | | M | ± 20% |
| | | P | +10% -0% |
| | | Z | +80% -20% |

**CAP, P .068UF-K-50V**

# NOTES:



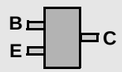




| | Q357 | Q369 | Q951 | Q952 | Q953 | Q954 |
|---|---|---|---|---|---|---|
| E | 0.69 | 14.83 | 6.79 | 1.48 | 9.51 | 8.18 |
| B | 0.00 | 0.00 | 11.90 | 8.86 | 11.90 | GND |
| C | GND | 14.63 | 6.14 | 0.84 | 8.98 | 8.82 |

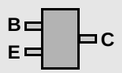
| | Q955 | Q956 | Q957 | Q958 | Q961 | Q962 |
|---|---|---|---|---|---|---|
| E | 137.3 | 0.93 | 8.86 | 8.85 | 0.00 | 1.48 |
| B | 69.8 | 69.9 | GND | 11.90 | 0.00 | 8.86 |
| C | 13.8 | 450.5 | 9.51 | 8.18 | GND | 0.84 |

| IC 351 | |
|---|---|
| 1 | 1.71 |
| 2 | 1.71 |
| 3 | 1.71 |
| 4 | GND |
| 5 | 1.82 |
| 6 | 220.00 |
| 7 | 127.00 |
| 8 | 131.00 |
| 9 | 122.00 |

**IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP***




**CHIP TRANSISTOR LEAD DESIGNATION**




## Nota:

**La medición de los voltajes se hizo con un Voltímetro Digital.**

## Note:

**Obtained voltages with a multimeter.**

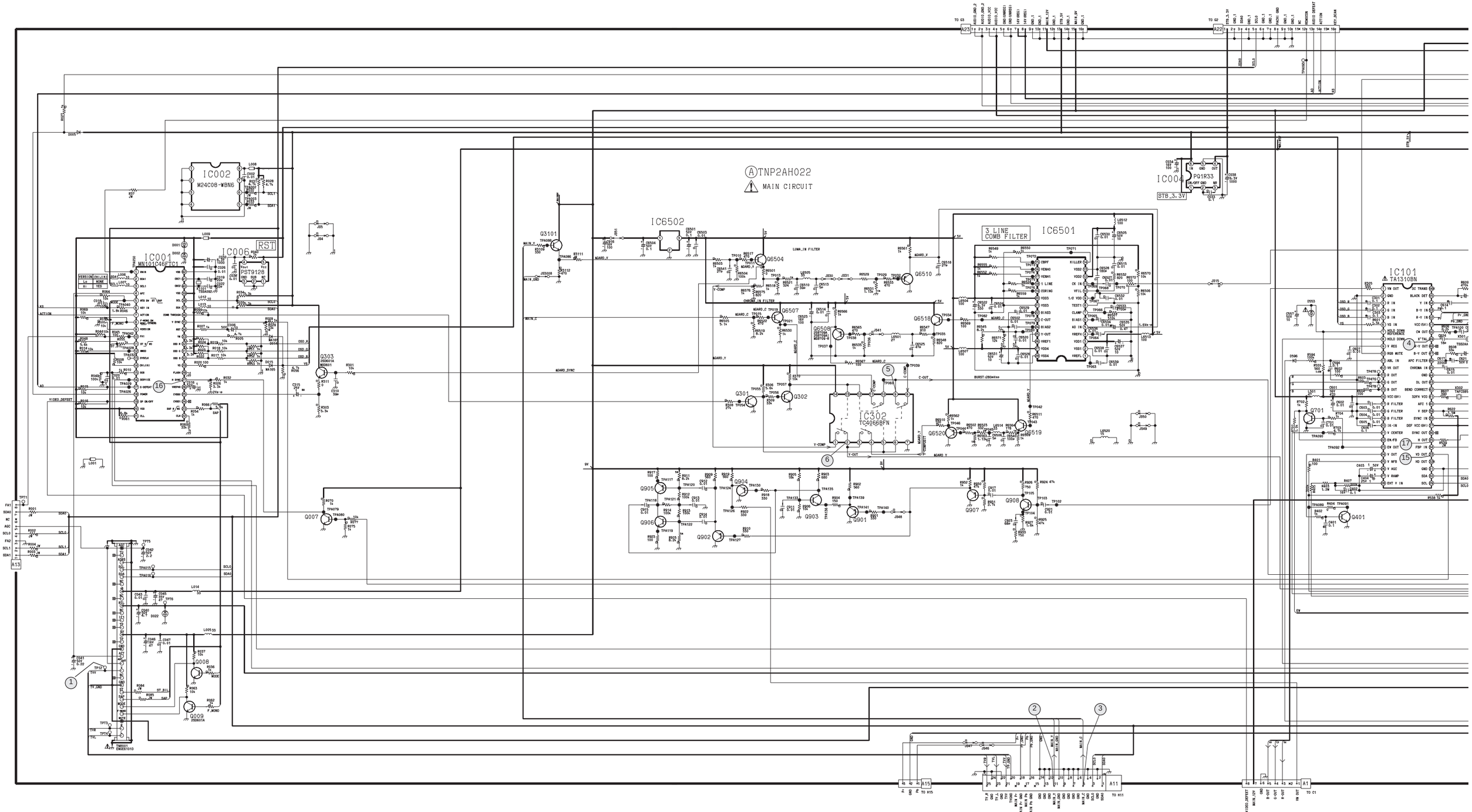
**IMPORTANT SAFETY NOTICE**

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

**NOTA DE SEGURIDAD**

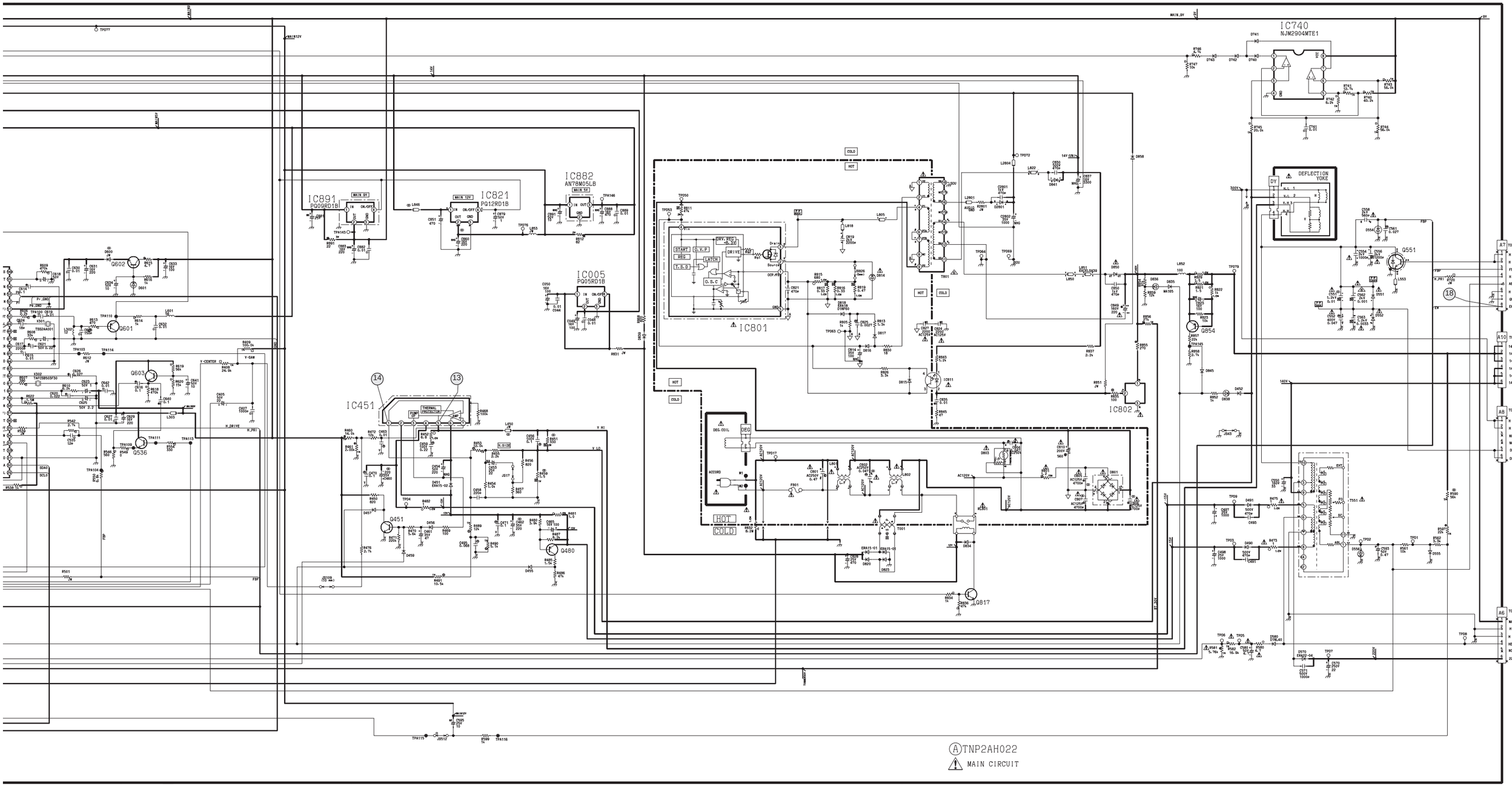
LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚠.

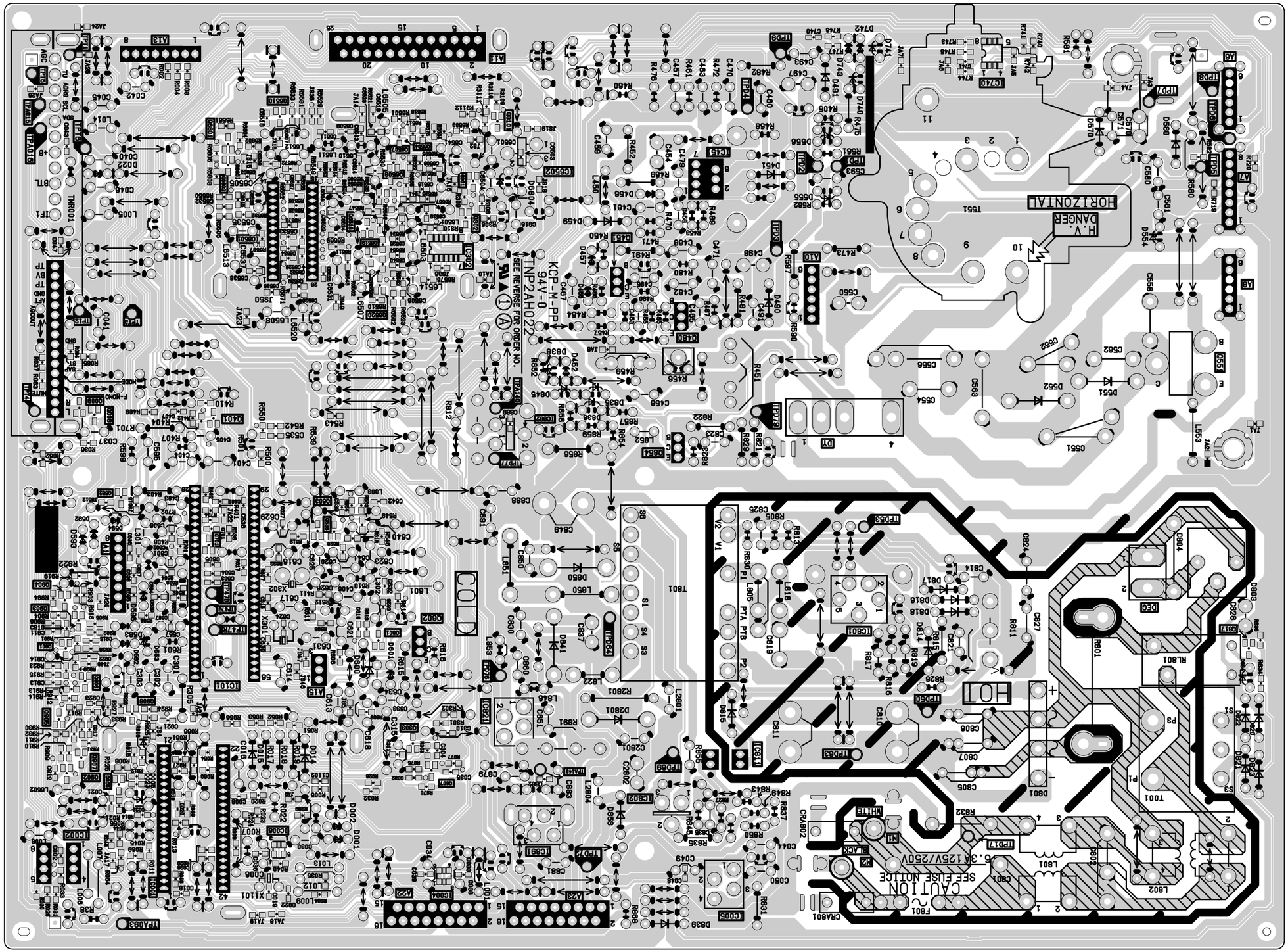
# A-BOARD SCHEMATIC DIAGRAM, LEFT PORTION - DIAGRAMA ELECTRICO TARJETA A, SECCION IZQUIERDA

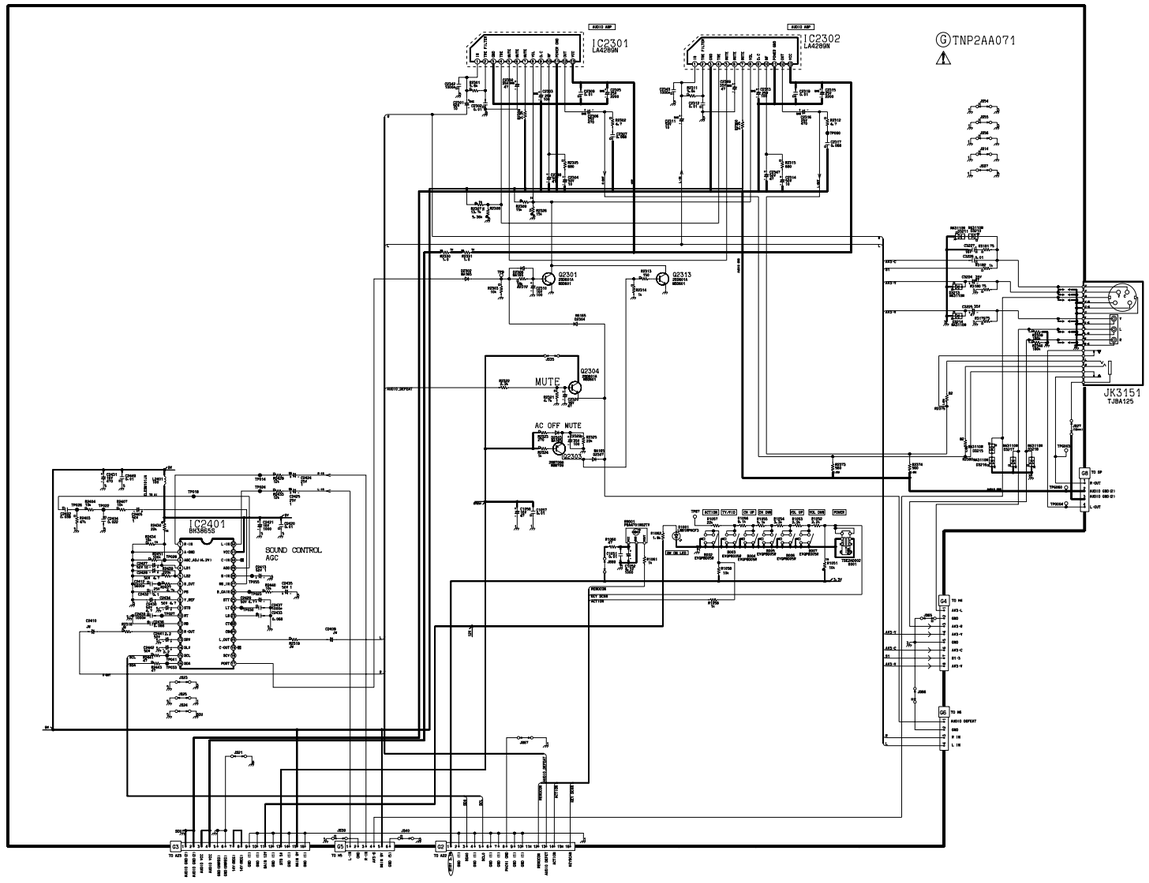


# A-BOARD SCHEMATIC, RIGHT PORTION - DIAGRAMA ELECTRICO TARJETA A, SECCION DERECHA

**ALL MODELS**

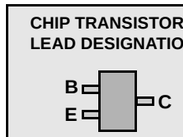



HORIZONTAL
H.V.
DANGER
HOT
COLD
CAUTION
SEE FUSE NOTICE
6.3A 125V/250V
TNP2AH022
KCP-M-PD
94V-0
SEE REVERSE FOR ORDER NO.




| | Q2301 | Q2303 | Q2304 |
|---|---|---|---|
| E | 0.00 | 13.07 | 0.00 |
| B | 1.79 | 0.00 | 4.98 |
| C | GND | 12.23 | 0.00 |

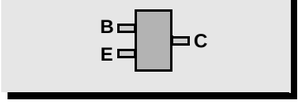
**CHIP TRANSISTOR LEAD DESIGNATION**




| IC2301 | | IC2302 | |
|---|---|---|---|
| 1 | 4.19 | 1 | 4.19 |
| 2 | 4.19 | 2 | 4.19 |
| 3 | GND | 3 | GND |
| 4 | 2.49 | 4 | 2.49 |
| 5 | 0.00 | 5 | 0.00 |
| 6 | 8.85 | 6 | 8.85 |
| 7 | 8.87 | 7 | 8.86 |
| 8 | 4.78 | 8 | 4.78 |
| 9 | 11.16 | 9 | 11.16 |
| 10 | 11.06 | 10 | 11.02 |
| 11 | GND | 11 | GND |
| 12 | 11.12 | 12 | 11.08 |
| 13 | 24.11 | 13 | 24.11 |

| IC2401 | | | |
|---|---|---|---|
| 1 | 4.36 | 17 | 0.00 |
| 2 | GND | 18 | n.c |
| 3 | 2.55 | 19 | n.c |
| 4 | 0.00 | 20 | 4..38 |
| 5 | 0.10 | 21 | n.c |
| 6 | 4.43 | 22 | n.c |
| 7 | 4.39 | 23 | 4.37 |
| 8 | 4.38 | 24 | 4.35 |
| 9 | 0.00 | 25 | 0.00 |
| 10 | 4.36 | 26 | 4.39 |
| 11 | 4.37 | 27 | 4.38 |
| 12 | 4.38 | 28 | 4.38 |
| 13 | 0.00 | 29 | 4.36 |
| 14 | 0.00 | 30 | n.c |
| 15 | 2.14 | 31 | 8.80 |
| 16 | 2.14 | 32 | 4.36 |

**IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP***




**Schematic Notes**

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value notes is inductance in µH.
4. Test point indicated by ● ; Test point but no pin ○.
5. Components indicated with ⚠ are critical parts and replacement should be made with manufacture specified replacement parts only.
6. ▬ (**BOLD LINE**) indicates the route of B+ supply.
7. The schematic diagrams are current at the time of printing and are subject to change without notice.
8. Ground symbol indicates **HOT GROUND CONNECTION**; indicates COLD GROUND.

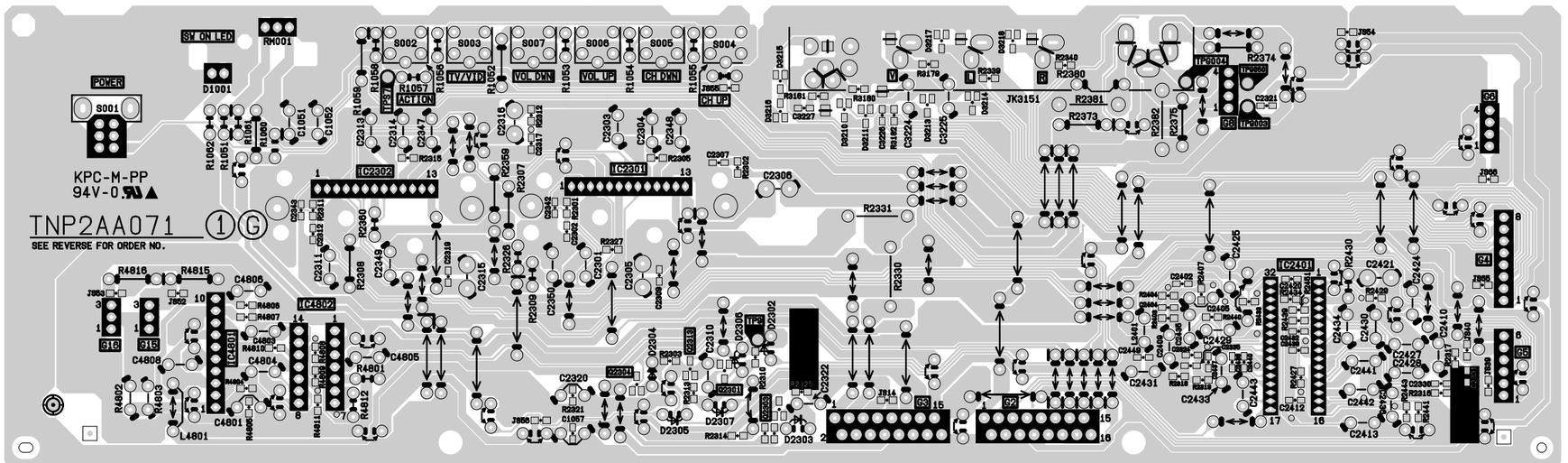
*NOTE: All other component symbols are used for engineering design purposes.*

## Nota:

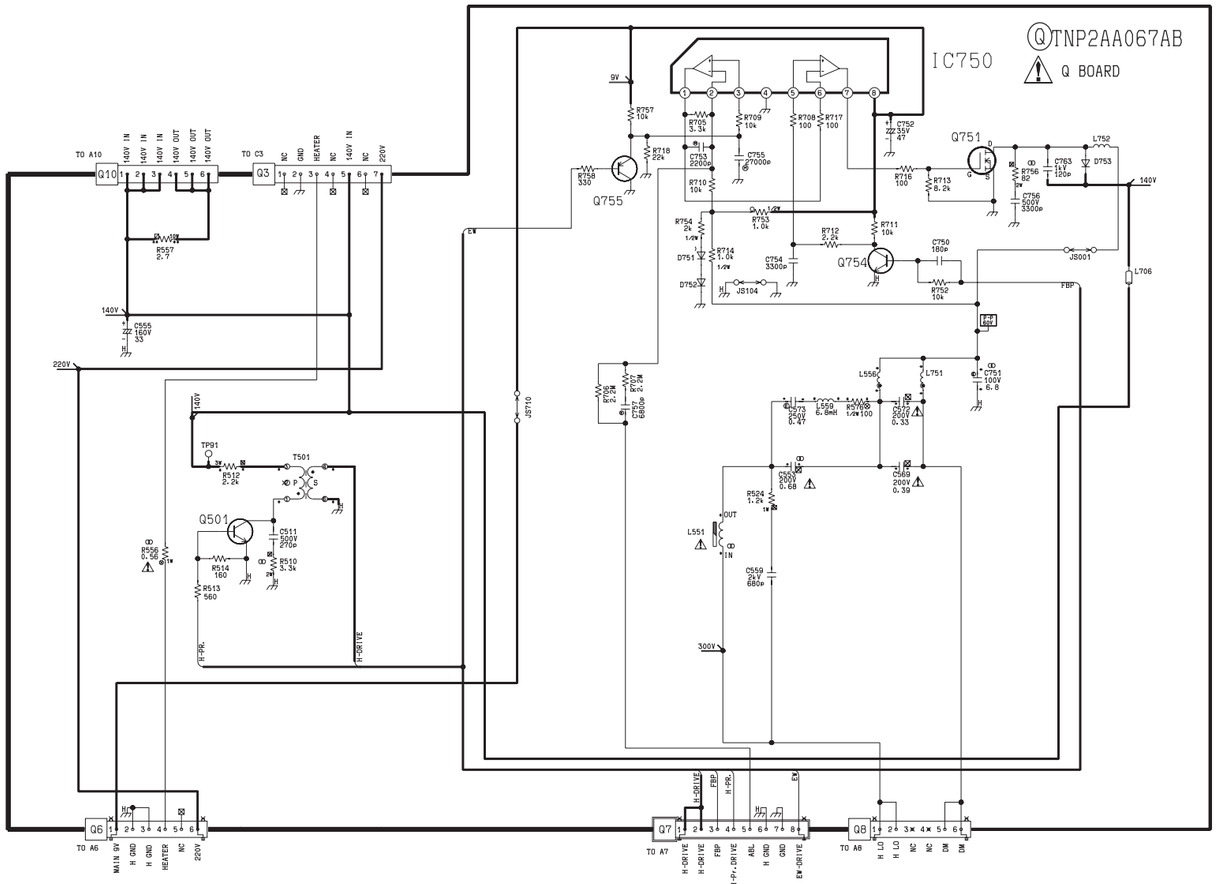
**La medición de los voltajes se hizo con un Voltímetro Digital.**

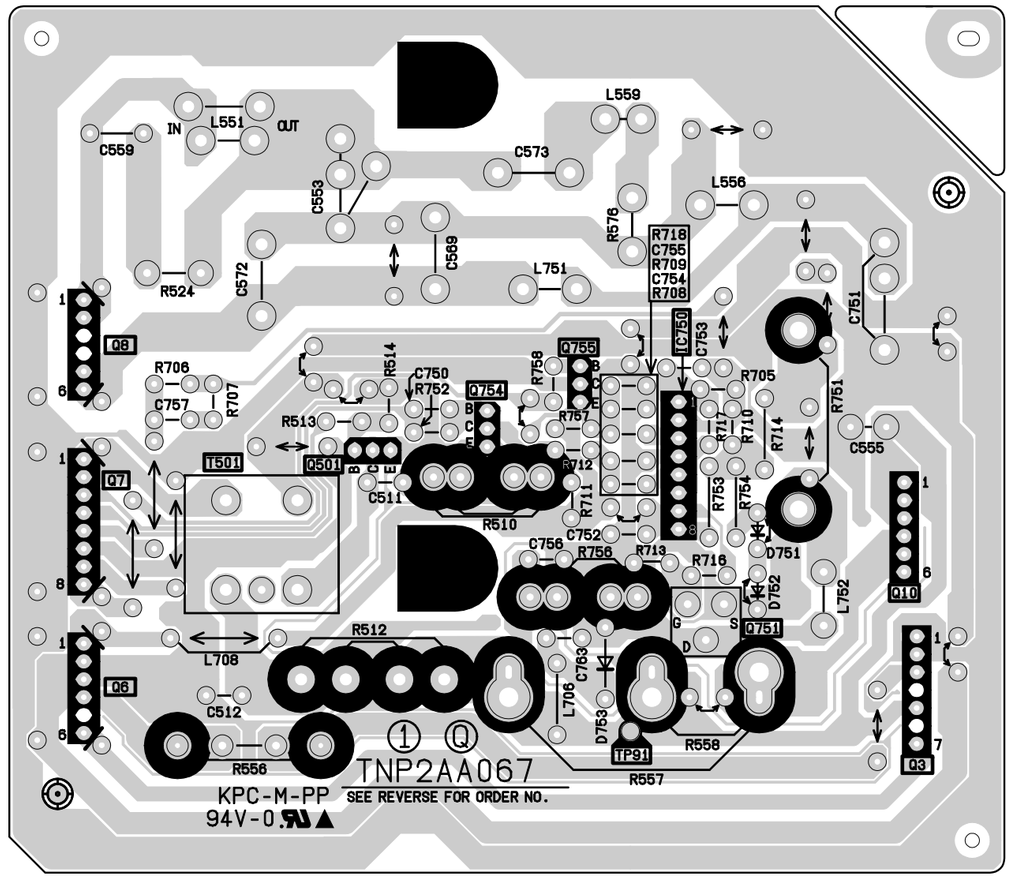
## Note:

**Obtained voltages with a digital multimeter.**



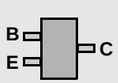
# Q-BOARD SCHEMATIC DIAGRAM, LAYOUT & VOLTAGES - DIAGRAMA ELECTRICO, DE CIRCUITO IMPRESO Y VOLTAJES TARJETA Q



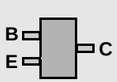




| | Q501 | Q751 | Q754 | Q755 |
|---|---|---|---|---|
| E | 0.00 | 6.69 | 0.00 | 4.27 |
| B | 80.00 | 20.44 | 4.70 | GND |
| C | 0.00 | GND | GND | 4.82 |

**IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP***




**CHIP TRANSISTOR LEAD DESIGNATION**




| IC750 |
|---|
| 1 . . . . . 3.03 |
| 2 . . . . . 4.85 |
| 3 . . . . . 4.84 |
| 4 . . . . . GND |
| 5 . . . . . 4.72 |
| 6 . . . . . 2.99 |
| 7 . . . . . 6.77 |
| 8 . . . . . 8.88 |

## Nota:

**La medición de los voltajes se hizo con un Voltímetro Digital.**

## Note:

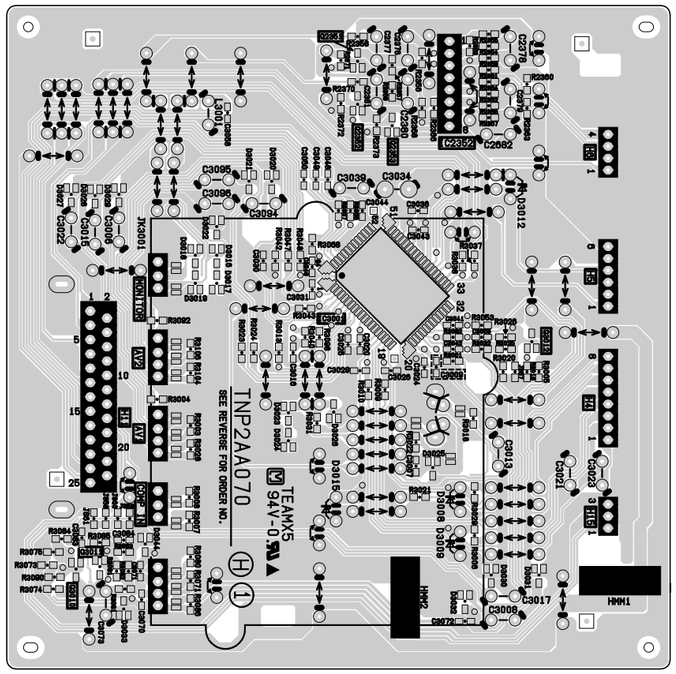
**Obtained voltages with a digital multimeter.**

### IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

### NOTA DE SEGURIDAD

LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚠.




| | Q2351 | Q2352 | Q2353 | Q3010 | Q3011 | Q3012 |
|---|---|---|---|---|---|---|
| E | 0.00 | 13.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| B | 1.79 | 0.00 | 4.98 | 4.98 | 4.98 | 4.98 |
| C | GND | 12.23 | 0.00 | 0.00 | 0.00 | 0.00 |

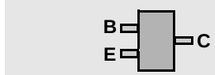
**Nota:**

**La medición de los voltajes se hizo con un Voltímetro Digital.**

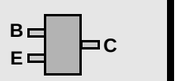
**Note:**

**Obtained voltages with a digital multimeter.**

**IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP***

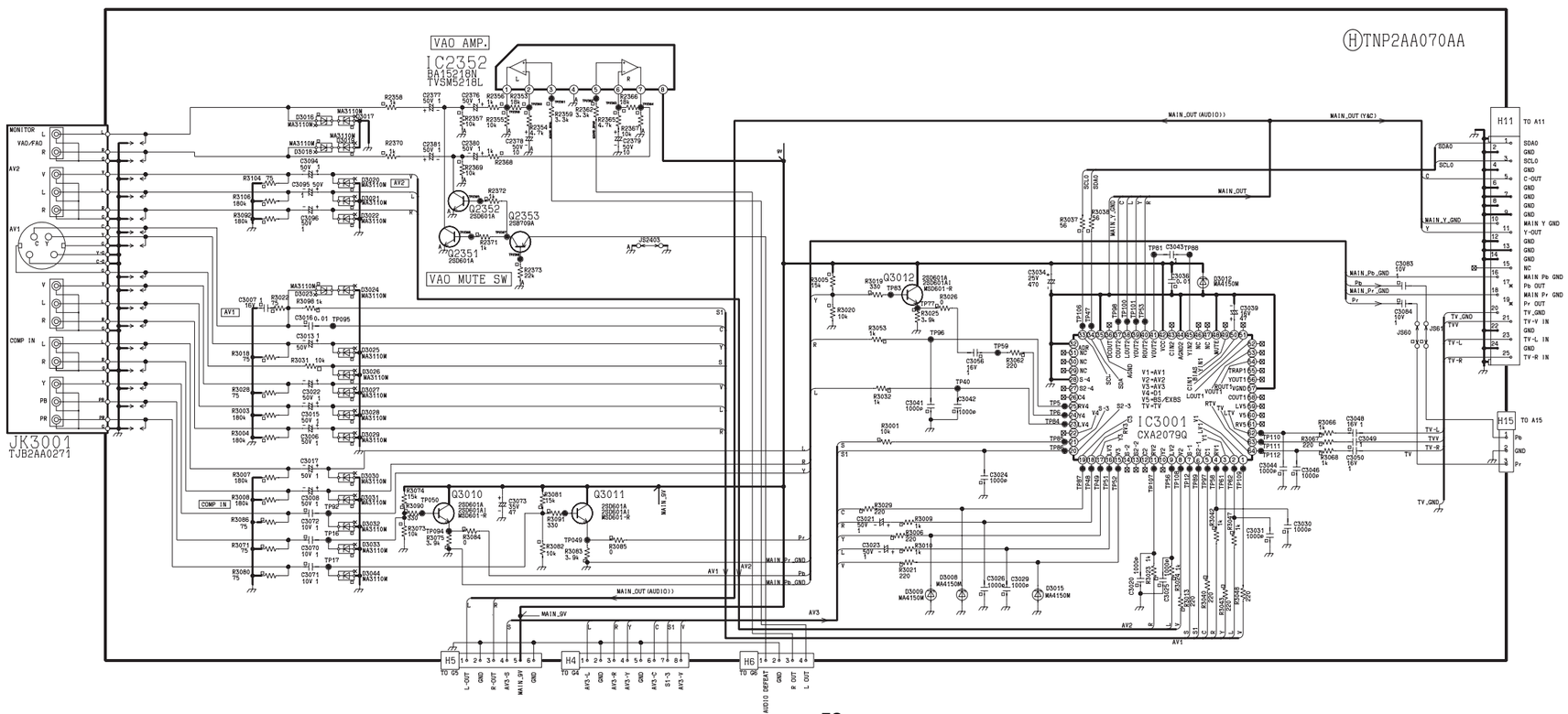



**CHIP TRANSISTOR LEAD DESIGNATION**

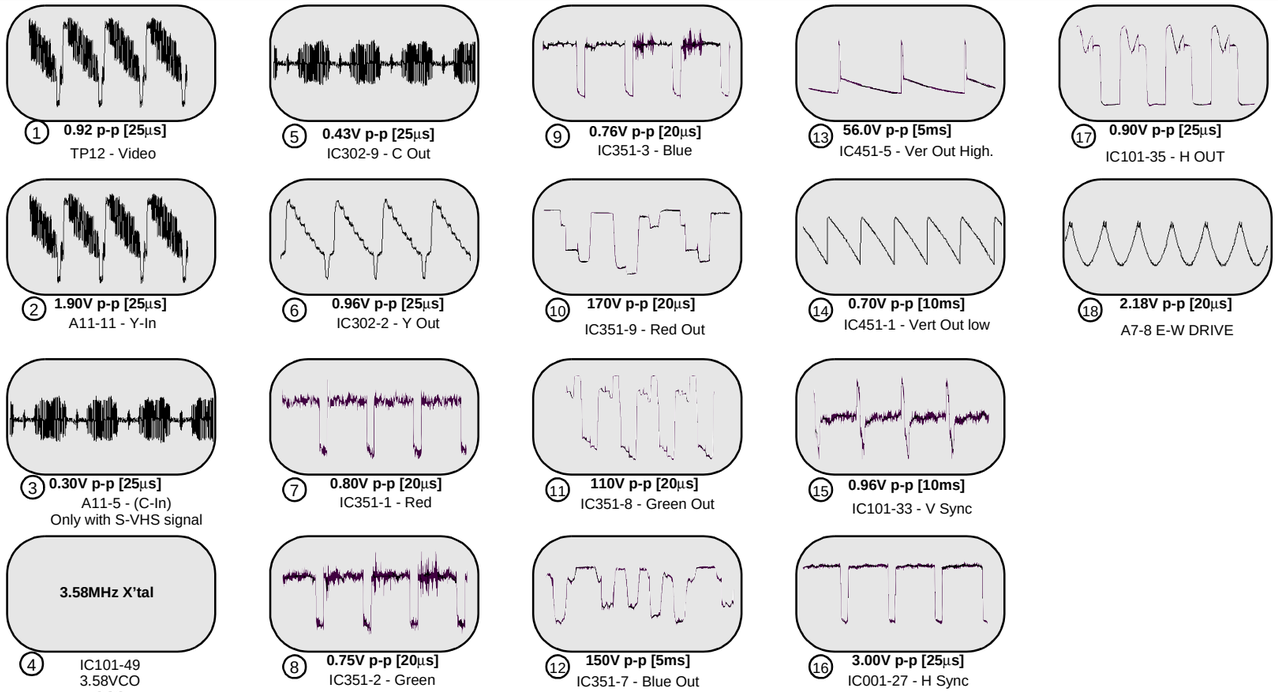



| IC2352 | |
|---|---|
| 1 | 5.54 |
| 2 | 5.55 |
| 3 | 5.51 |
| 4 | GND |
| 5 | 5.89 |
| 6 | 5.79 |
| 7 | 5.80 |
| 8 | 8.89 |

| IC3001 | | | |
|---|---|---|---|
| 1 | 3.80 | 33 | 3.64 |
| 2 | 4.42 | 34 | 3.55 |
| 3 | 3.92 | 35 | 0.00 |
| 4 | 4.43 | 36 | n.c |
| 5 | 4.39 | 37 | 4.29 |
| 6 | 0.00 | 38 | 4.46 |
| 7 | 4.89 | 39 | 4.72 |
| 8 | 3.92 | 40 | 4.46 |
| 9 | 4.39 | 41 | 4.98 |
| 10 | n.c | 42 | 8.89 |
| 11 | 4.40 | 43 | n.c |
| 12 | n.c | 44 | GND |
| 13 | n.c | 45 | 5.45 |
| 14 | n.c | 46 | n.c |
| 15 | 3.93 | 47 | n.c |
| 16 | 4.39 | 48 | GND |
| 17 | 3.84 | 49 | n.c |
| 18 | 4.41 | 50 | 4.45 |
| 19 | 4.37 | 51 | n.c |
| 20 | 0.10 | 52 | n.c |
| 21 | 4.86 | 53 | n.c |
| 22 | n.c | 54 | n.c |
| 23 | 4.43 | 55 | n.c |
| 24 | 3.94 | 56 | n.c |
| 25 | 4.43 | 57 | GND |
| 26 | n.c | 58 | n.c |
| 27 | n.c | 59 | n.c |
| 28 | GND | 60 | n.c |
| 29 | n.c | 61 | n.c |
| 30 | n.c | 62 | 4.43 |
| 31 | n.c | 63 | 4.61 |
| 32 | GND. | 64 | 4.43 |



## Waveforms - A-Board




**NOTE: Waveforms 7 to 12 are in C-Board.**

| | Q004 | Q005 | Q007 | Q008 | Q009 | Q301 | Q302 |
|---|---|---|---|---|---|---|---|
| E | 3.29 | 0.32 | 0.00 | 0.74 | 0.74 | 0.00 | 0.64 |
| B | 0.00 | 1.19 | 3.44 | 0.00 | 0.00 | 7.70 | 0.00 |
| C | 3.29 | GND | GND | GND | GND | GND | GND |

| | Q303 | Q401 | Q451 | Q480 | Q530 | Q531 | Q532 |
|---|---|---|---|---|---|---|---|
| E | 2.49 | 0.65 | 0.71 | 15.63 | 11.23 | 11.91 | 0.00 |
| B | 4.48 | 5.11 | 0.00 | 0.00 | 11.82 | 0.00 | 0.00 |
| C | 1.86 | GND | GND | 15.86 | 11.89 | 10.21 | 0.00 |

| | Q536 | Q551 | Q601 | Q602 | Q603 | Q701 | Q817 |
|---|---|---|---|---|---|---|---|
| E | 2.63 | 0.00 | 0.00 | 5.74 | 1.88 | 0.62 | 0.74 |
| B | 8.86 | -44.88 | 0.00 | 8.64 | 8.89 | 4.27 | 0.00 |
| C | 1.99 | GND | 0.68 | 5.02 | 1.70 | GND | GND |

| | Q854 | Q901 | Q902 | Q903 | Q904 | Q905 | Q906 |
|---|---|---|---|---|---|---|---|
| E | 0.14 | 1.27 | 1.27 | 3.06 | 6.91 | 8.54 | 0.33 |
| B | 0.00 | GND | GND | 6.90 | GND | 4.35 | 4.36 |
| C | 139.70 | 1.98 | 1.96 | 2.42 | 7.36 | 8.84 | 0.00 |

| | Q907 | Q908 | Q3101 | Q6504 | Q6507 | Q6508 | Q6510 |
|---|---|---|---|---|---|---|---|
| E | 0.74 | 4.2 | 3.89 | 3.18 | 2.64 | 1.72 | 1.95 |
| B | 0.00 | 7.22 | 8.88 | 4.98 | 9.98 | 0.00 | GND |
| C | GND | GND | 2.34 | 2.52 | 2.00 | 2.38 | 2.62 |

| | Q6518 | Q6519 | Q6520 |
|---|---|---|---|
| E | 3.93 | 3.53 | 1.99 |
| B | 4.98 | 4.98 | GND |
| C | 3.26 | 2.86 | 2.64 |

### IC 001

| | | | |
|---|---|---|---|
| 1 | 3.23 | 22 | 2.04 |
| 2 | 4.97 | 23 | 3.29 |
| 3 | 4.97 | 24 | n.c |
| 4 | 1.59 | 25 | 1.41 |
| 5 | 2.84 | 26 | 2.44 |
| 6 | 3.29 | 27 | 2.64 |
| 7 | 3.29 | 28 | GND |
| 8 | 2.85 | 29 | 0.00 |
| 9 | 3.29 | 30 | 0.11 |
| 10 | 3.29 | 31 | 0.11 |
| 11 | 0.20 | 32 | 0.11 |
| 12 | 3.29 | 33 | 0.00 |
| 13 | 1.65 | 34 | 0.00 |
| 14 | 0.42 | 35 | 2.54 |
| 15 | 0.00 | 36 | 3.74 |
| 16 | 0.00 | 37 | 3.40 |
| 17 | 3.15 | 38 | 3.60 |
| 18 | 3.06 | 39 | 3.29 |
| 19 | 0.92 | 40 | 1.59 |
| 20 | 3.29 | 41 | 1.59 |
| 21 | 1.47 | 42 | 0.00 |

### IC 002

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | GND |
| 4 | GND |
| 5 | 4.97 |
| 6 | 4.97 |
| 7 | GND |
| 8 | 4.98 |

### IC 004

| | |
|---|---|
| 1 | 4.98 |
| 2 | GND |
| 3 | 1.25 |
| 4 | 3.29 |
| 5 | GND |
| 6 | 4.98 |

### IC 005

| | |
|---|---|
| 1 | 9.13 |
| 2 | 4.98 |
| 3 | GND |
| 4 | 9.05 |

### IC 006

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | GND |
| 4 | 3.29 |
| 5 | 3.29 |

### IC 451

| | |
|---|---|
| 1 | 1.34 |
| 2 | 15.55 |
| 3 | -13.79 |
| 4 | -15.55 |
| 5 | 8.71AC |
| 6 | 15.61 |
| 7 | 1.34 |

### IC 101

| | | | |
|---|---|---|---|
| 1 | 4.15 | 29 | 3.60 |
| 2 | GND | 30 | 3.50 |
| 3 | 3.34 | 31 | GND |
| 4 | 3.33 | 32 | n.c |
| 5 | 3.32 | 33 | 2.74 |
| 6 | 0.00 | 34 | 1.10 |
| 7 | 6.00 | 35 | 0.48 |
| 8 | 5.27 | 36 | n.c |
| 9 | 5.16 | 37 | 8.89 |
| 10 | 0.00 | 38 | 3.00 |
| 11 | 5.91 | 39 | 6.21 |
| 12 | n.c | 40 | 7.44 |
| 13 | 2.62 | 41 | 5.90 |
| 14 | 2.46 | 42 | 5.00 |
| 15 | 2.50 | 43 | 1.00 |
| 16 | 8.76 | 44 | 0.00 |
| 17 | 5.09 | 45 | 1.82 |
| 18 | 4.92 | 46 | 1.44 |
| 19 | 4.878 | 47 | n.c |
| 20 | 2.54 | 48 | n.c |
| 21 | 3.07 | 49 | 3.97 |
| 22 | 4.27 | 50 | 3.40 |
| 23 | 0.64 | 51 | 5.02 |
| 24 | 0.66 | 52 | 3.07 |
| 25 | 5.11 | 53 | 3.10 |
| 26 | 2.05 | 54 | 3.75 |
| 27 | 4.30 | 55 | 2.49 |
| 28 | 5.07 | 56 | n.c |

### IC 302

| | |
|---|---|
| 1 | 1.39 |
| 2 | 2.63 |
| 3 | 2.63 |
| 4 | 2.64 |
| 5 | 7.69 |
| 6 | 7.69 |
| 7 | GND |
| 8 | 2.38 |
| 9 | 2.38 |
| 10 | 2.38 |
| 11 | 2.01 |
| 12 | 0.00 |
| 13 | 0.00 |
| 14 | 8.88 |

### IC 740

| | |
|---|---|
| 1 | 0.00 |
| 2 | 3.96 |
| 3 | 1.83 |
| 4 | GND |
| 5 | 0.87 |
| 6 | 1.83 |
| 7 | 0.00 |
| 8 | 8.88 |

### IC 801

| | |
|---|---|
| 1 | 1.34 |
| 2 | 0.10 |
| 3 | 4.30AC |
| 4 | 16.25 |
| 5 | 0.00 |

### IC 802

| | |
|---|---|
| 1 | 0.13 |
| 2 | 10.09 |
| 3 | GND |

### IC 821

| | |
|---|---|
| 1 | 13.13 |
| 2 | 11.92 |
| 3 | GND |
| 4 | 1.90 |

### IC 882

| | |
|---|---|
| 1 | 11.92 |
| 2 | GND |
| 3 | 4.99 |

### IC 891

| | |
|---|---|
| 1 | 13.13 |
| 2 | 8.91 |
| 3 | GND |
| 4 | 1.90 |

### IC 6502

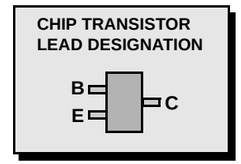
| | |
|---|---|
| 1 | 8.88 |
| 2 | GND |
| 3 | 4.98 |

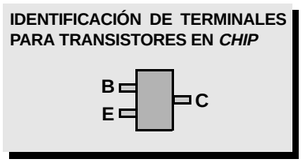
### IC 811

| | |
|---|---|
| 1 | 11.15 |
| 2 | 10.14 |
| 3 | 1.24 |
| 4 | 14.92 |

### IC 6501

| | | | |
|---|---|---|---|
| 1 | 1.47 | 15 | 4.85 |
| 2 | GND | 16 | 4.85 |
| 3 | 4.91 | 17 | 4.85 |
| 4 | 3.44 | 18 | 0.00 |
| 5 | 2.07 | 19 | 0.00 |
| 6 | 1.42 | 20 | 4.90 |
| 7 | 3.20 | 21 | 0.00 |
| 8 | 0.00 | 22 | 3.49 |
| 9 | 2.44 | 23 | 3.93 |
| 10 | 1.71 | 24 | 1.68 |
| 11 | 2.19 | 25 | 3.54 |
| 12 | 4.97 | 26 | 3.94 |
| 13 | 0.00 | 27 | 4.94 |
| 14 | 0.00 | 28 | 0.00 |



**PRINTED IN USA**
**K00112538CM1122**